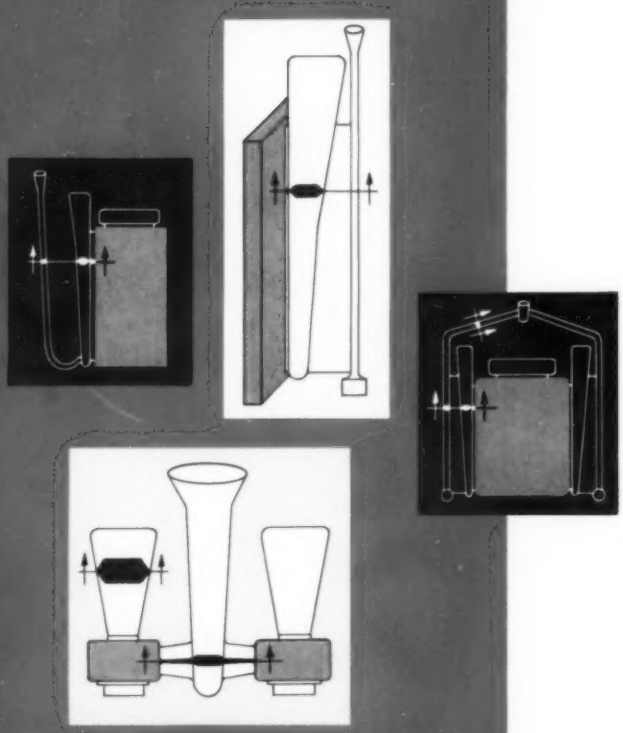
AUGUST
1961

FOUNDRY

A PENTON PUBLICATION



GATING Permanent Mold Aluminum Castings

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METALGRAMS

. . . news of "Electromet" ferroalloys and metals

UNION CARBIDE METALS

AUGUST 1961

GE IMPROVES MACHINABILITY WITH "SMZ" ALLOY -- All 30,000 and 40,000 psi gray iron made at General Electric's newly modernized foundry in Elmira, N. Y. is inoculated with 2 lbs. of "SMZ" alloy per ton. Why? These irons tend to chill in thin sections, making machining difficult. By adding "SMZ" alloy, GE can pour ½-in. thick sections or less that can be easily machined. In a typical test, GE's chill blocks showed a chill of 22/64-in. for uninoculated iron. The iron inoculated with "SMZ" alloy had only 14/64-in. chill.

* * *

ALLOYS BOOST GRAY IRON PROPERTIES -- GE also gets special properties by adding alloys in the ladle. Chromium and molybdenum improve wear resistance. Nickel and silicon increase electrical resistivity. Chromium and silicon give a close grain structure in heavy sections, which gives a good surface finish after machining. Chromium and nickel retard growth at high temperatures. For more information on GE's use of these ladle additions, including "SMZ" alloy, write for the article, "More Efficient Cupola Melting," in the Summer 1961 issue of UNION CARBIDE METALS REVIEW.

For more information circle 553 on page 87

* * *

MAKING MORE PERFECT METALS -- Vacuum melting is meeting the higher property requirements of space and atomic uses. Vacuum-melted steels, superalloys, and ultra-pure metals have better properties than their air-melted counterparts. Union Carbide Metals supplies a complete range of ferroalloys and metals for steels and superalloys melted in a vacuum. UCM also offers high-purity, vacuum-melted ingots of columbium, tantalum and vanadium metal. For more information, call your Union Carbide Metals representative today. Also, ask for the article, "Making More Perfect Metals," in the Summer 1961 issue of UNION CARBIDE METALS REVIEW.

For more information circle 554 on page 87

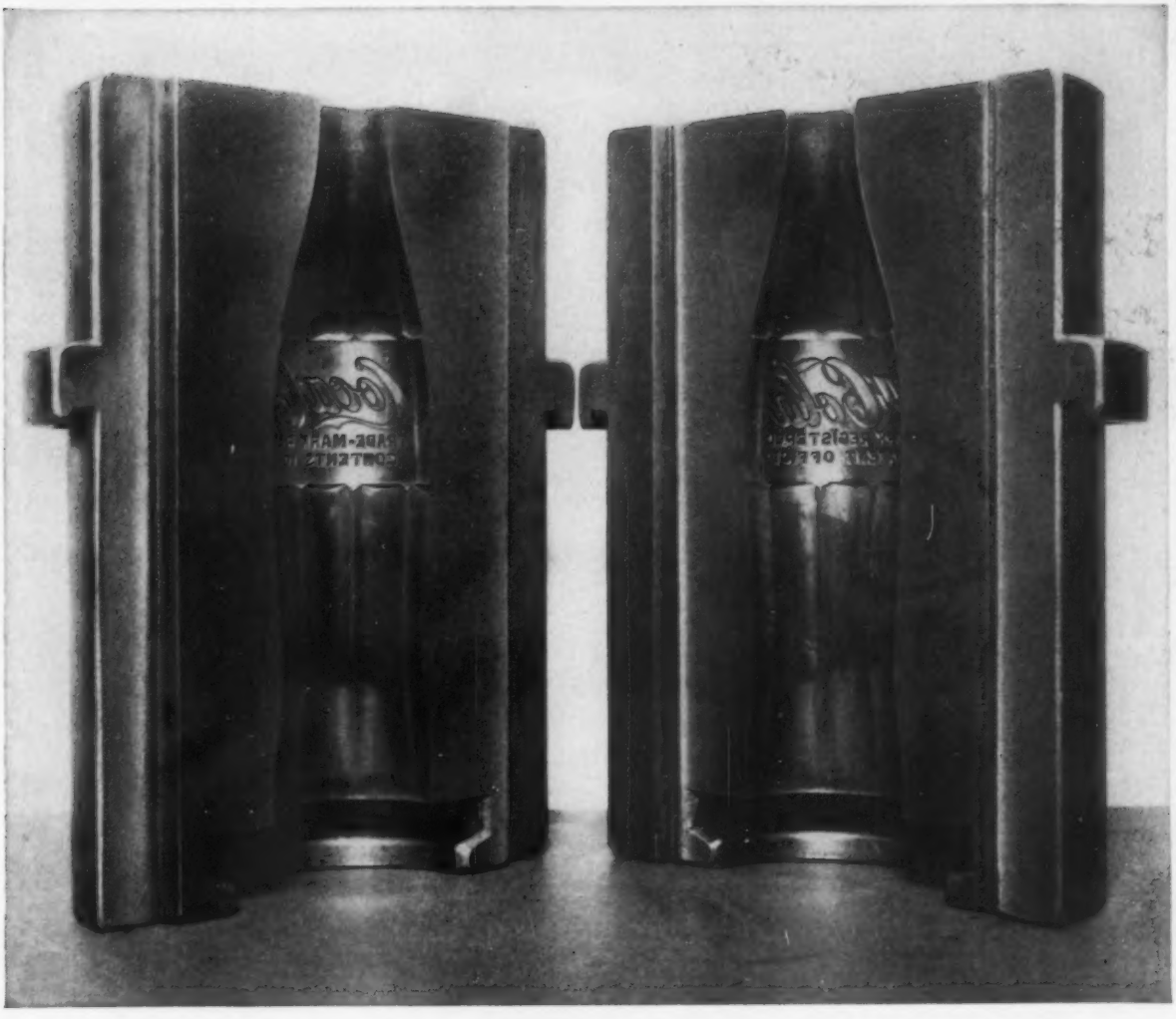
* * *

THIS 'N' THAT -- Magnesium-ferrosilicon is the lowest-cost alloy for making ductile iron. It also promotes high as-cast ductility. Write for F-20,069 and F-20,120 or circle 555 on page 87. . . . Money-saving advantages of "EM" briquets include no weighing, higher recoveries, easy identification, closer control of casting chemistry, easier handling, and savings in raw materials. Briquets are added to gray iron in the cupola. Write for F-20,066 or circle 556 on page 87. . . . "Simplex" ferrochrome features rapid solubility, low price and extremely low carbon content -- characteristics needed for chromium additions made during reduction or finishing periods of a stainless steel heat. Write for F-20,118 or circle 557 on page 87.

* * *

UNION CARBIDE METALS COMPANY, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. In Canada: Union Carbide Canada Ltd., Toronto.

"Electromet," "EM," "Simplex," "SMZ," and "Union Carbide" are registered trade marks of Union Carbide Corporation.



Nickel cast iron helps Coke get over 5 million bottles per mold

Demonstrates advantages of nickel-alloyed iron for foundrymen and users of castings

Bottles for Coca-Cola* are made in nickel cast iron molds for two important reasons. Nickel cast iron molds have the right combination of engineering properties to assure bottles of a high quality. And nickel cast iron molds have the stamina and strength to assure a long service life...more than 5 million bottles per mold.

You and your customers benefit when you add nickel to iron castings

Nickel helps give Coca-Cola bottle molds a dense, close-grained structure ...particularly on the chilled cavity which comes in contact with molten glass. And by giving you, the foundrymen, better control over castings, nickel helps you cut castings rejects to a minimum.

Your customers also benefit from nickel cast iron's superior strength and resistance to wear, erosion and cracking. Nickel cast iron bottle molds retain their dimensional stability under cyclic heating and cooling. They resist scaling and wear. As a result, the castings-user gets longer service life from nickel cast iron, with lower maintenance and replacement costs.

Write Inco for helpful information

Whether you make glass molds or any other type of iron castings, there's a good chance that nickel can help you improve them. For detailed information on the family of nickel cast irons, just drop a note to Inco, c/o Foundry Industry Manager, outlining your problems with iron castings. Perhaps Inco nickel and Inco Research can help you solve them.

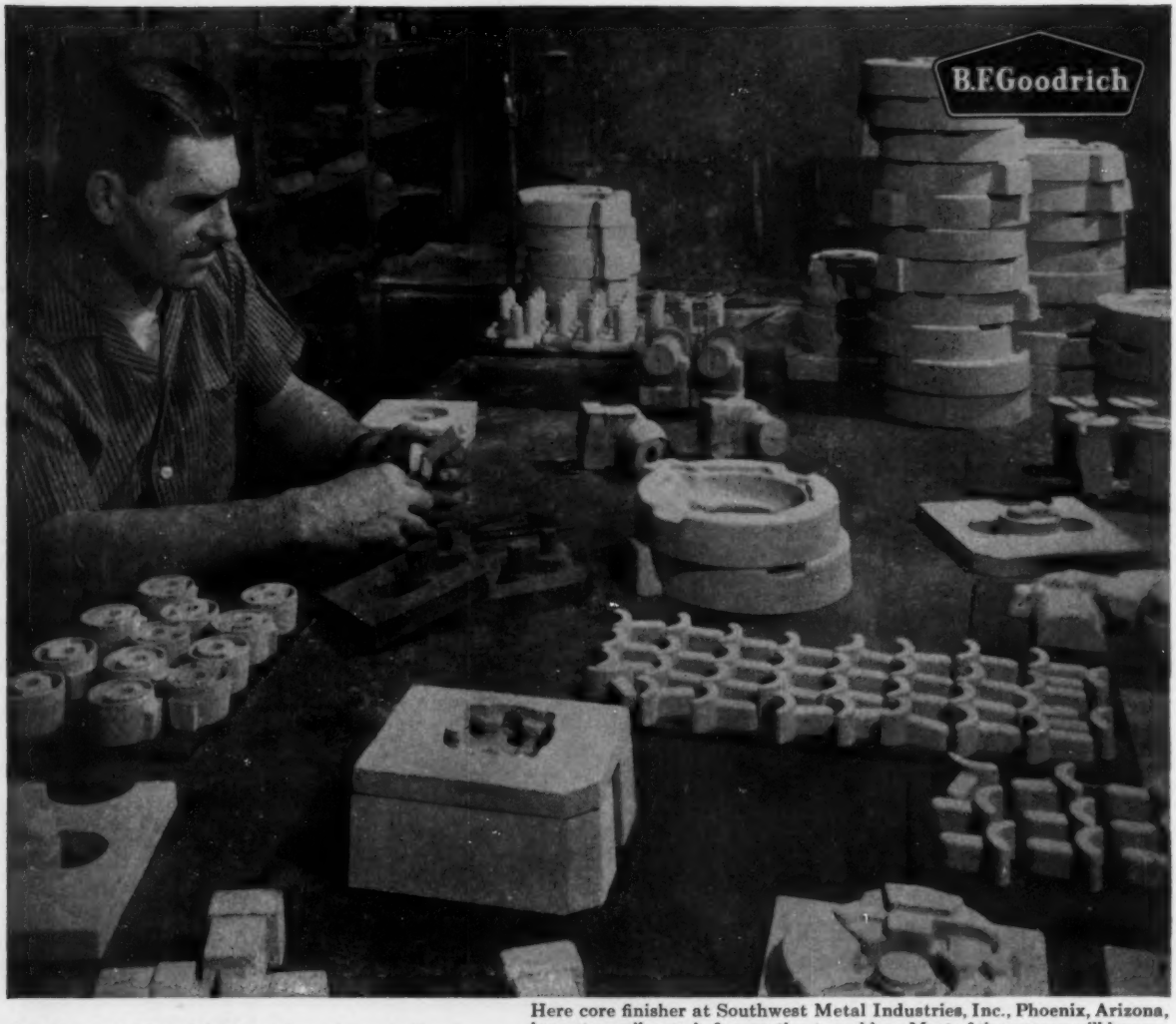
*"Coke" and "Coca-Cola" are registered trademarks of The Coca-Cola Company.

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street New York 5, N. Y.

INCO NICKEL

NICKEL MAKES CASTINGS PERFORM BETTER LONGER



Here core finisher at Southwest Metal Industries, Inc., Phoenix, Arizona, inspects small cores before routing to molders. Most of these pours will become castings for pumps for jet engines.

Southwest Metal Industries, Inc., tells...

Good-rite CB-40 eliminates gas retention on X-ray quality castings

Hear from Mr. Earl L. Brocious, Manager of Quality Control, as he reports another successful performance by Good-rite CB-40, the low-gassing mold and core binder.

Eliminates gas. "We use Good-rite CB-40 on all our castings of X-ray quality—about 40% of our work—because it eliminates the problem of gas retention. It is no longer necessary to depend on the core finisher to vent and surface-protect cores with an alcohol-based product to insure proper gas removal."

Excellent dimensional stability. "Dimensional stability is a second advantage," Mr. Brocious says, "and we tend to get a smoother finish with a given sand than has been possible with other means."

Increased Accuracy. Mr. Brocious also relates how Good-rite CB-40 promotes better accuracy, especially helpful where cores are intricate. Foundrymen in this shop appreciate the fact that Good-rite CB-40 cuts out irritating smoke caused by other methods and binders.

Additional information. You can get complete information about Good-rite CB-40—more success stories like this and information on how you can benefit, by writing Department PD-4, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical

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Good-rite CHEMICALS

August 1961
Volume 89—Number 8

FOUNDRY
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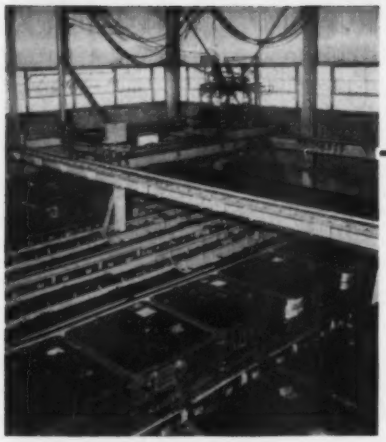

Ductile iron castings are annealed in the mold at the John Deere Malleable Works, East Moline, Ill. At the heart of the operation is a system of seven storage and cooling lines and three traveling storage bridges, partly shown here, which permit controlled cooling for prescribed periods of time. See p. 96.

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New ductile iron line at John Deere Malleable Works, Deere & Co., East Moline, Ill., produces and handles molds automatically. It features controlled cooling of castings in molds to impart properties desired

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FOUNDRY is edited primarily for management, production, technical, and purchasing personnel in foundries. A copy is sent at no cost to each metal casting plant in the U. S. and Canada employing 20 or more workers and to selected smaller foundries. Additional copies are sent to each foundry to the extent necessary to serve all key foundry personnel on a personal or routed basis. A limited number of copies is supplied at no cost to educational institutions. Subscriptions in the U. S., possessions, and Canada for home-addressed copies and copies not qualified for under the above principles: One year, $10. Single copy, $1. Other countries: One year, $20. Single copy, $2. Published monthly by The Penton Publishing Co., Penton Building, Cleveland 13, Ohio. Accepted as controlled circulation publication at Cleveland, Ohio.

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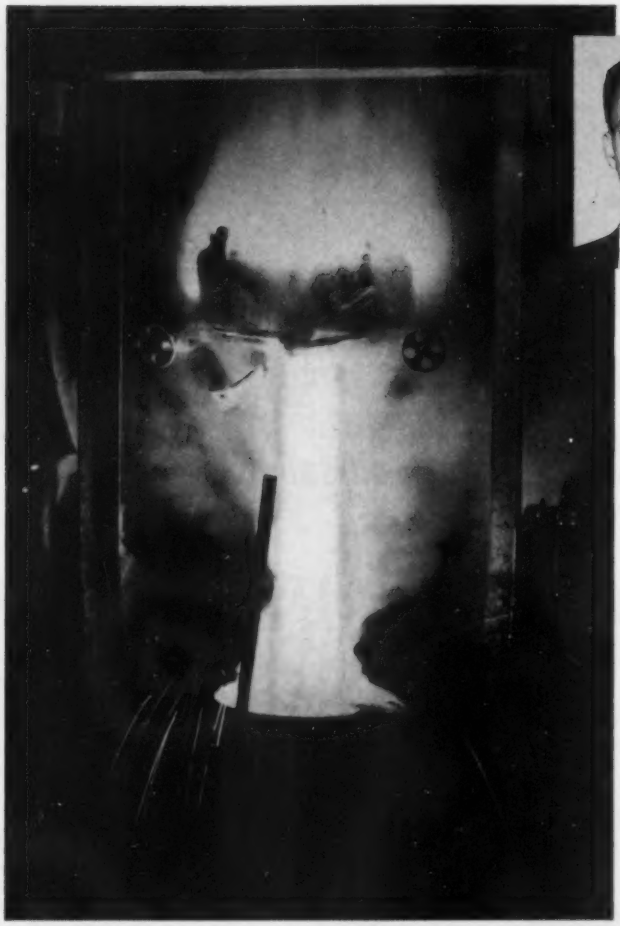
THE EDITORS' WORKSHOP

HOW MANY FOUNDRIES?: During the last couple of years, there has been considerable discussion about foundry closings. Now, since FOUNDRY has completed compilation of data for the 1961-62 edition of *Penton's Foundry List*, its biennial census of all casting producers in the United States and Canada, the facts are available.

As reported on pp. 50-53 and p. 37 of this issue, the drop in plants totals only 206, and that figure actually is lower than it has been in recent censuses. Even more to the point, the number of jobbing foundries actually rose by 150 and the number of captive foundries by 19. The plants doing *both* captive and jobbing work dropped by 375. All of these figures represent long-term trends. There are, for example, about 1100 more jobbing foundries today than there were in 1947.

VARIED READING: There's a lot of variety in this issue of FOUNDRY. In addition to the PFL roundup, general interest material includes "Nine Ways To Sell More Castings" (p. 54) and the reports of international, national, and regional foundry meetings. More specialized articles include "Gating Permanent Mold Aluminum Castings" (p. 38), "Casting Ingot Molds and Stools" (p. 42), "Handling and Control of Metal for Aluminum Diecastings" (p. 56), "Controlled Cooling of Ductile Iron Castings" (p. 96), "Preformed Ceramic Cores" (p. 134), and others.

MORE TO COME: Next month, there will be still more variety. Look for such presentations as "Gray Iron Specifications—Fact or Fiction," by H. W. Lownie, Battelle Memorial Institute, and C. F. Walton, Gray Iron Founders' Society; "Some Useful Techniques for Calculating Casting Weights," by R. L. Cooper, National Engineering Co.; "Converting to Synthetic Sand," by Andre Herrault and Harry Heron, Burndy Corp.; and others too numerous to list.



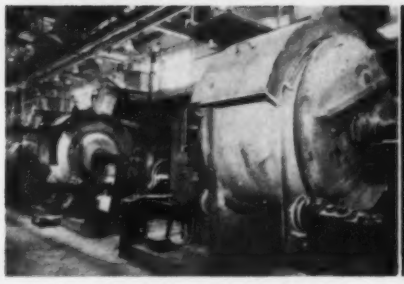
G. M. Johnston, manager of the new automated Neptune Meter Company foundry in Maspeth, New York, says:

"Our four Detroit Electric Furnaces made the move with us"

"In planning our new automated Maspeth foundry," states Mr. Johnston, "we counted on continued production from our four Detroit Electric Furnaces even though we have had them for over 20 years.

"We have always been strong on Detroits," continued Mr. Johnston, "because they are a fast and effective means of melting bronze. Quality is consistent, operation is clean and cool and the yield is high."

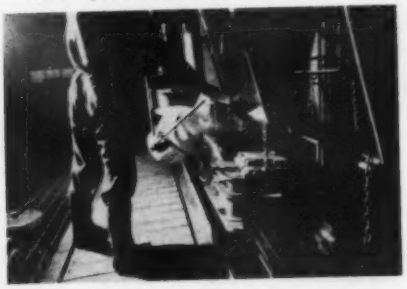
The detailed photographs below show how Detroit Indirect Arc Electric Furnaces play an important role in the increased output and efficiency of the new Neptune foundry.



Neptune, the country's oldest and largest manufacturer of liquid meters, uses a single bank of four Detroit furnaces for a large share of its production.

The furnaces are filled from an overhead balcony and set for the proper heating cycle. "Detroits' rocking action," explains Mr. Johnston, "helps keep the melt uniform and efficiently utilizes the arc's electric energy."

"Also, Detroit's simple, automatic operation helps to produce cleaner working conditions, more efficient use of manpower and higher production schedules."



On completion of melting, ladles are moved into position and filled and then moved along to the molds for pouring.

DETROIT ELECTRIC FURNACE

Division of Kuhlman Electric Company
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Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Elsa" Ltd., San Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 38, N. Y.; MEXICO: Cia Proveedora de Industrias, S.A. Apartado Postal No. 2783, Mexico 7, D.F., Mexico.

For More Information Circle 560, Page 87

NOW...ONE WASH FOR ALL TYPES OF CORES

Surface penetration study reveals a single water-soluble graphite wash* can be used successfully in ferrous foundries on resin-shell, oil-sand and silicate-bonded sands.

Proof is demonstrated by these 20-power magnifications of core sections coated with

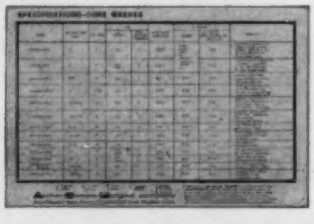
*VELVA-PLAST GWA-2

New graphitic refractory wash developed by the ADM Foundry Research Laboratory

These photo-micrographs illustrate the adaptability of VELVA-PLAST GWA-2. Note the varying degrees of penetration into different types of core and mold surfaces, depending upon the composition of the solvent. This unique water-activated coating is exceptionally compatible with alcohol (up to 20% of the weight of the solvent), which materially affects penetration, bonding and drying characteristics.

VELVA-PLAST GWA-2 is an effective refractory at pouring temperatures up to 2800° F. With controlled penetration, inclusions in the casting can be eliminated. Peel is sure, thorough, clean. The new wash remains in suspension and will not settle out. VELVA-PLAST GWA-2 can be applied by swabbing, spraying, or dipping, and is an excellent filler resulting in exceptionally smooth core surfaces.

RESULTS: Regardless of your core composition, you get clean, smooth casting surfaces without a trace of burn-on, and free from penetration defects.



A complete line of "VELVA" washes is also available with graphite, zircon, and ceramic bases to meet every founding requirement. A wall chart (17" x 22") has been prepared to guide foundrymen in the use of ADM washes for smoother castings. Why not send for your copy today?

Write to:

Archer-Daniels-Midland company

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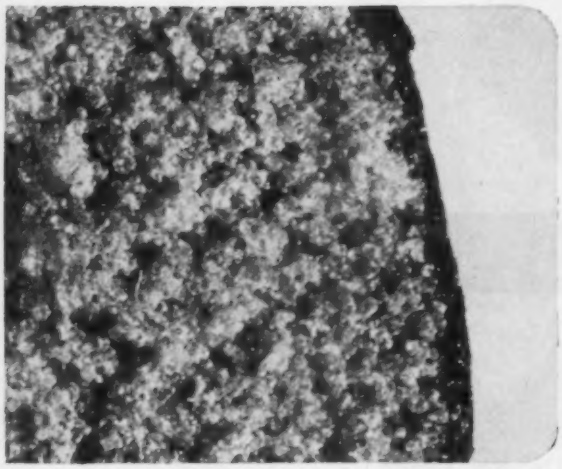

Fig. 1. SHELL CORE coated with VELVA-PLAST GWA-2 mixed with water.

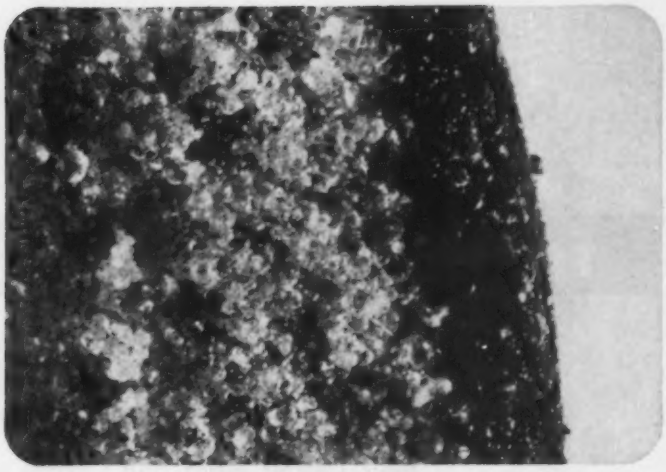

Fig. 2. SHELL CORE coated with VELVA-PLAST GWA-2 suspended in a solution of 80% water and 20% alcohol. Addition of alcohol aids wetting of waxy surface and assures deeper penetration of the wash.

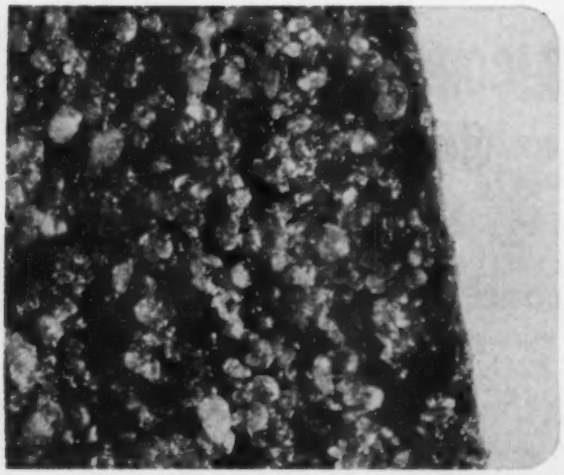

Fig. 3. OIL-SAND CORE coated with VELVA-PLAST GWA-2 mixed with water.

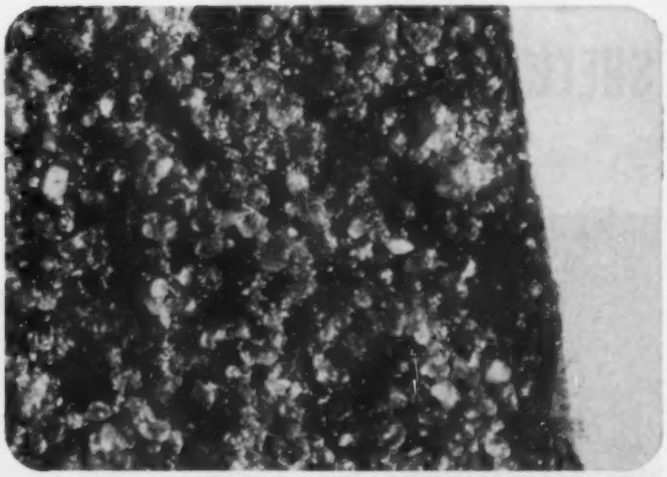

Fig. 4. OIL-SAND CORE coated with VELVA-PLAST GWA-2 suspended in a solution of 80% water and 20% alcohol. Penetration of water-borne wash into surface of oil-sand core is adequate in many instances, but the addition of alcohol speeds up drying of wash.

Fig. 5. SILICATE-BONDED CORE coated with VELVA-PLAST GWA-2 mixed with water. Penetration is adequate without use of alcohol.

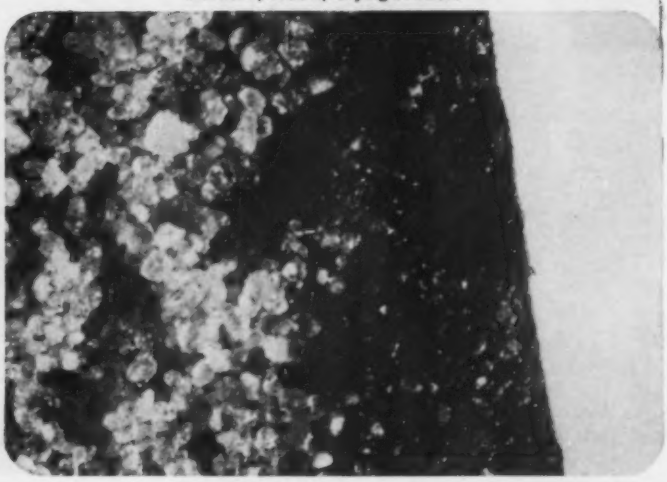

Fig. 6. SILICATE-BONDED CORE coated with VELVA-PLAST GWA-2 suspended in a solution of 80% water and 20% alcohol. The effect of alcohol is evident but would not be required in this case.

foundries cut costs and save

NOTE: Effective August 15, 1961 C&S Products Co. Inc. will move their Detroit Plant and Offices to DeKalb, Illinois

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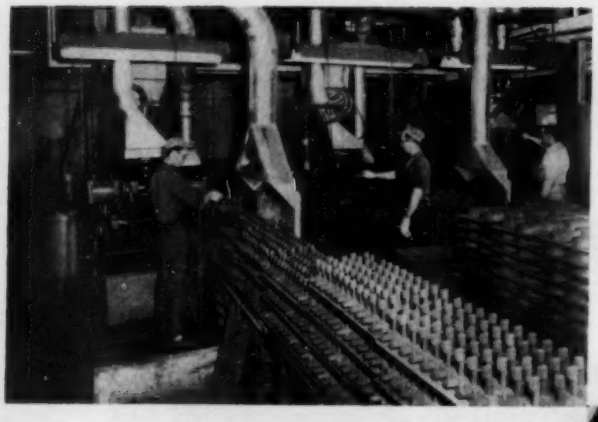

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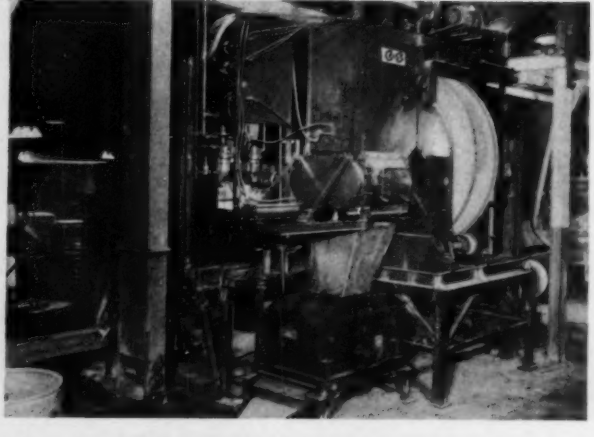

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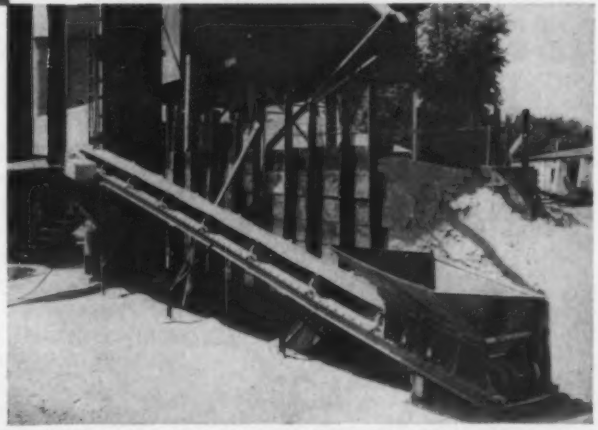

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Over five years service in foundry sand...JOY Limberoller® idlers require no maintenance

At this large automotive foundry conventional steel idlers were a constant source of trouble. Spilled foundry sand would work its way into bearings and stop the idler rolls from turning. The result was torn conveyor belting and costly downtime.

After a trial installation, this foundry standardized on Joy Limberoller belt conveyor idlers throughout the plant. The frozen idler problem was completely eliminated, as well as the need for frequent inspection.

The Limberoller idler works so well because it has just two bearings instead of six. These are mounted at both ends of a flexible wire rope, to which neoprene discs are molded. The bearings are up out of the sand, unaffected by spillage. Fouled bearings are never a problem, and maintenance costs go down to almost nothing. Join the foundry men who have ended their sand conveyor problems by replacing steel idlers with Joy Limberollers. Conversion is quick and easy. We'll be glad to give you all the details . . . write for bulletin 2747-13.

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

For More Information Circle 563, Page 87

With the EDITORS

ARTIST RETIRES: Older readers will recall the series of "Bill" stories which appeared in all but two issues of FOUNDRY over a period of 35 years. Events that led to the series started in the fall of 1918 when the editor of FOUNDRY, the late A. O. Backert, received a story about a fictitious foundry character named Bill from the late Pat Dwyer, then a foundry superintendent in Nova Scotia.

The assignment of preparing cartoons to accompany the story was given to a young artist by the name of Harry L. Richey, then head of the Penton Editorial Art Department. This article appeared in the February, 1919 issue under the heading "Bill Throws Some Light on Solomon's Temple."

"Moonlight and Memories—and a Few Mosquitoes" was the caption on this Richey cartoon in the Sept. 15, 1930 issue of FOUNDRY

In the meantime, Pat Dwyer had joined the staff of FOUNDRY as engineering editor, so the team of Dwyer and Richey continued to present a chapter in the "Adventures of Bill," until the author died in 1954. During that period 576 articles were presented (FOUNDRY was published twice a month for 13 of the 35 years). There were approximately 1650 drawings by Artist Richey, and many originals are hanging in foundries throughout the world.

I bring this up because Artist Richey, who also is manager of the Penton Building and purchasing agent of our company, is retiring, and after Aug. 1 will move into a new home at North East 21st Road, Imperial Point, Ft. Lauderdale, Fla.

On behalf of the many readers who have enjoyed these drawings, I want to thank Harry Richey for his contributions to the FOUNDRY editorial staff. And all of us on FOUNDRY, editorial, business, and circulation, hope that the Richeys have a wonderful time in the Florida retirement.

Action Taken: It has been apparent for some time that unions operating in exhibition halls in a number of cities were demanding more from exhibitors for services than the traffic could bear. The situation in Detroit has been given considerable publicity because some large shows have been cancelled out of Cobo Hall.

The AFS, with the 1962 International Foundry Congress scheduled for Detroit, has recognized the pressing problem. Since Philadelphia in 1960, Bill Maloney of AFS has preached to exhibit managers, city officials, and labor unions the need for contracts outlining exactly what rules and charges would govern the installing, tearing down, and operating of exhibits. Evidently these efforts have paid off, since the AFS and labor unions signed a contract on July 6 in the presence of Detroit's mayor and representatives of the foundry industry (page 23). It is interesting to note that the signing took place with the local press present, and Detroit citizens know that this agreement has been reached.

That the people of Detroit are pleased with the results of the AFS campaign is indicated in the following editorial which appeared in the Detroit *Free Press* on July 10 under the heading "Cobo Hall Debt to Foundrymen:"

"The Big American Foundrymen's Society may have turned up a most happy solution to troubles that have endangered Cobo Hall's reputation as a great convention spot.

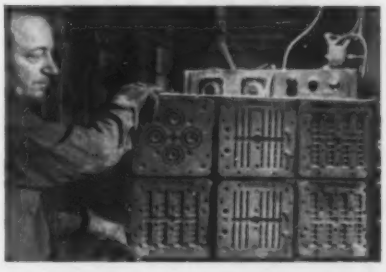
"As a condition to bringing its 1962 convention and exposition here, the AFS submitted a contract

CRUCIBLE STEEL SAVES THIS MUCH RESIN PER 250-LB. DRUM

...by using high-quality MC shell-molding sand.

The unique physical characteristics and screen distribution of Pennsylvania Glass Sand's MC shell-molding sand enable Crucible Steel Company of America to reduce resin content by 25% and produce higher quality castings with better finish. This superior shell-molding sand comes from the PGS deposit at Mill Creek, Oklahoma—nearly 1,500 miles from Crucible's Harrison, N. J., plant. Nevertheless, Crucible's resin savings more than offset shipping costs from Oklahoma, while MC sand helps them produce castings of top-market quality.

Supersil silica flour and 35 grades of foundry sands are available from PGS to meet any casting requirement. For full details, contact your nearest PGS office.



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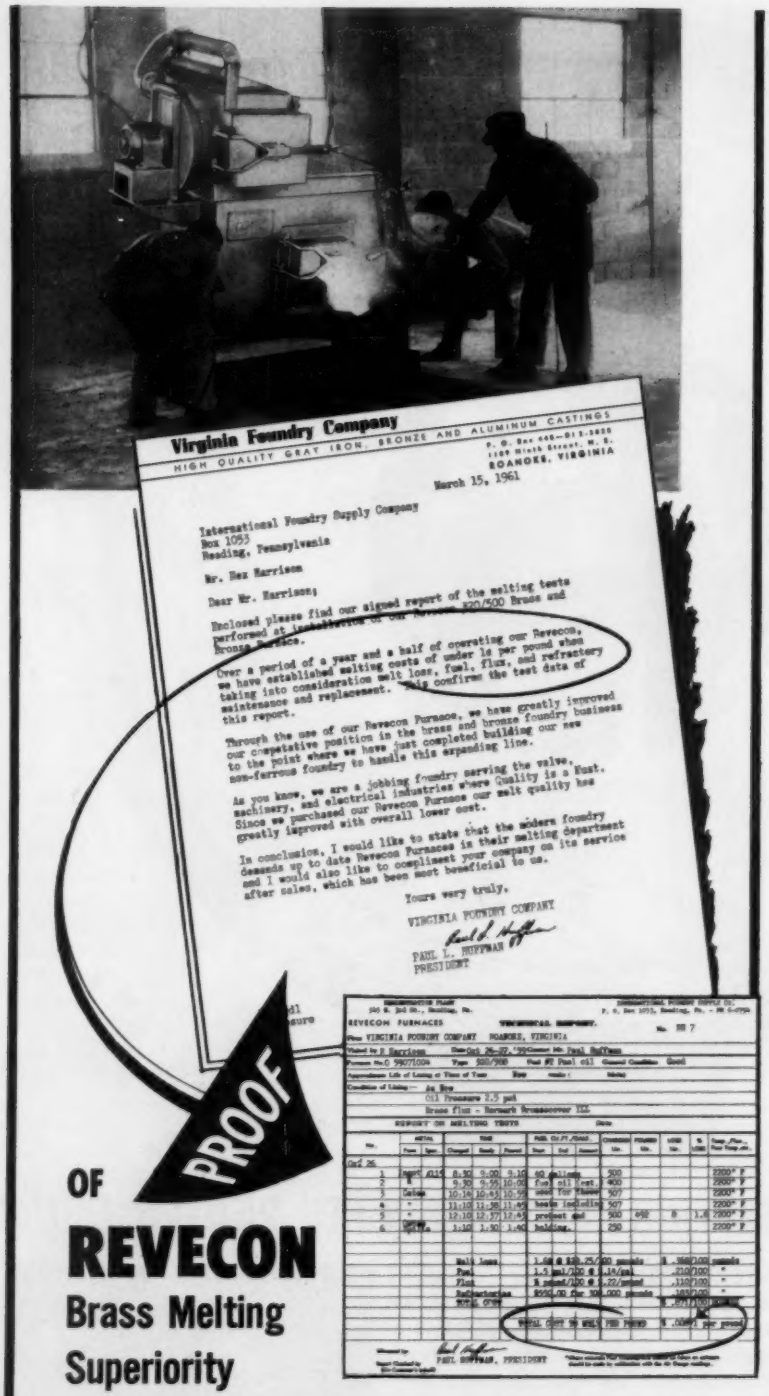

Virginia Foundry Company
HIGH QUALITY GRAY IRON, BRONZE AND ALUMINUM CASTINGS
ROANOKE, VIRGINIA
March 15, 1961
International Foundry Supply Company
Box 1053
Reading, Pennsylvania
Mr. Rex Harrison
Dear Mr. Harrison;
Over a period of a year and a half of operating our Revecon,
we have established melting costs of under 1¢ per pound when
taking into consideration melt loss, fuel, flux, and refractory
maintenance and replacement.
this report.
Through the use of our Revecon Furnace, we have greatly improved
our competative position in the brass and bronze foundry business
to the point where we have just completed building our new
non-ferrous foundry to handle this expanding line.
As you know, we are a jobbing foundry serving the valve,
machinery, and electrical industries where Quality is a Must.
Since we purchased our Revecon Furnace our melt quality has
greatly improved with overall lower cost.
In conclusion, I would like to state that the modern foundry
demands up to date Revecon Furnaces in their melting department
and I would also like to compliment your company on its service
after sales, which has been most beneficial to us.
Yours very truly,
VIRGINIA FOUNDRY COMPANY
PAUL L. HUFFMAN
PRESIDENT
REVECON FURNACES
TECHNICAL REPORT
PROOF
OF
REVECON
Brass Melting
Superiority

LET US SHOW YOU HOW to enjoy benefits like these in your Foundry! Non-crucible REVECON Furnaces are available in sizes for every foundry need: 50 lbs. to 30 ton capacity. REVECON offers the greatest possible flexibility when changing metals. Oil, gas or coke fired.

WRITE TODAY requesting our informative 20-page Brochure!

INTERNATIONAL FOUNDRY SUPPLY CO.

P. O. Box 1053, Reading, Pa. (FR 6-0794)

Canadian Representative: DREW BROWN LTD., 5410 Ferrier St., Montreal 9

containing precise terms. It was signed by City officials and officers of the unions involved.

"William M. Maloney, AFS general manager, obviously was pleased when Detroit became the first convention city to sign a contract specifying exactly what rules shall prevail.

" 'Detroit has the finest convention building not only in this country but in the entire world,' he said, 'and we feel that these ground rules should insure us an outstanding show.'

"Because so much of the past trouble at Cobo Hall has stemmed from confusion over work rules and conditions, the contract approach —along with recently revised procedures established by the City— may be exactly what is needed to end the difficulties that have plagued Cobo Hall from the day it opened.

"To the AFS, then, Detroit may owe a debt for banishing the dark cloud that has dimmed unnecessarily the potential of the City's magnificent facilities."

The editorial also included a reproduction of an aerial view of Cobo Hall with this caption: "A remedy will be tested."

Praise: I have talked with a number of exhibitors since the news broke in Detroit and have found everyone enthusiastic over the signing of the agreement. As the *Free Press* editorial says, the hope is expressed that this contract will ease the problem of delays and excessive costs in connection with industrial shows at Detroit and that similar contracts may govern future AFS shows.

FOUNDRY's congratulations to Bill Maloney and his staff and to President Al Hunt, who signed the contract, for a good piece of work to insure a successful show in Detroit next year.

Controls Coming?: With all the talk about mobilization, emergencies, and crises, I wonder if the foundry industry is in position to handle price controls, material controls, equipment priorities, and all the other things that go along with emergencies.

It probably is time for the foundry industry to get its house in order without delay. F.G.S.

For More Information Circle 565, Page 87

Where
maximum cleanliness is a "must"... EXLO® "75" Extra high in chromium and extra low in carbon, EXLO "75" is specially designed for use in very low-carbon stainless steels and heat-resistant alloys. There are two grades to choose from—.015% max. carbon and .025% max. carbon—both of which contain a minimum of 75% chromium. Because of its exceptional cleanliness, EXLO "75" is particularly adaptable to vacuum melting and other processes requiring minimum contaminant elements.

And don't forget the EXLO Standard Grades for use in low-carbon stainless and heat-resistant steels, irons and alloys. Like all EXLO ferrochromium alloys, they have high density and maximum cleanliness. Write for information or call your nearest VCA District Office. Vanadium Corporation of America, 420 Lexington Avenue, New York 17, N.Y. · Chicago · Cleveland · Detroit · Pittsburgh.

VANADIUM
CORPORATION OF AMERICA
Producers of alloys, metals and chemicals

3 reasons why our industry has accepted Multi-Mull

1. QUALITY OF PREPARED SAND

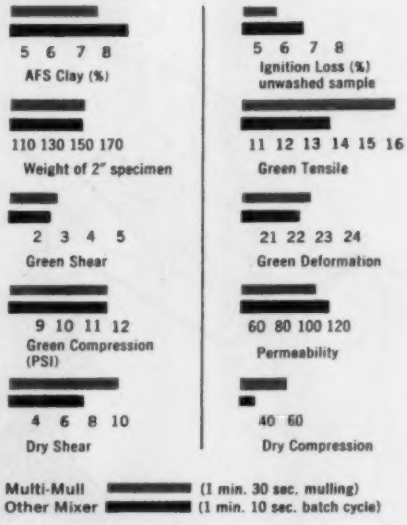
Test show Multi-Mull superiority

In a series of actual foundry tests (right), system sands from a Multi-Mull and another mixer are compared. The same base sands from the same foundry using the same bond slurry are the everyday product of entirely dissimilar mullers. Mulling times are shown.

The knowing sand technician sees here that which the practical man knows by "hand feel" — the Multi-Mull sand will lift better; will wash, cut and buckle less. There is more to sand quality than simple compression tests show.

The superiority of Multi-Mull sand is attributed to two factors:

1. The unique recirculation feature within the muller.
2. The sound mulling principle inherent to *all* Simpson mullers.



2. QUANTITY OF PREPARED SAND

It's continuous — all preparing time is used for mulling

In the Multi-Mull, time spent on weighing, batching, charging, wetting-out and discharge is eliminated . . . as is "pre-mull", dispersion and tempering of bonds. All time in the muller is spent in developing desired properties in the sand being mulled.

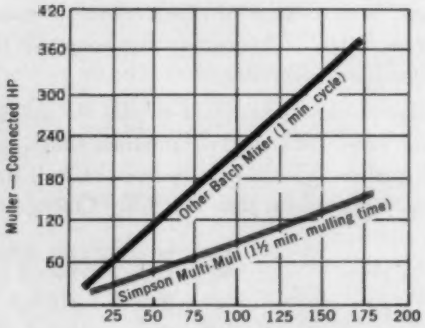
Time saved here contributes to Multi-Mull's proven ability to produce sand at the highest productive rate per dollar of investment in Mulling Equipment.

3. ECONOMY OF OPERATION

Multi-Mull can reduce the cost of sand preparing Installations

Lower cost per ton per hour of capacity is only one of the important savings you can expect with Multi-Mull. Continuous mulling also eliminates batching equipment and the costly maze of multiple bins, controls and separate sand handling devices which must serve batch mixer installations. Less time and manpower is required to operate and maintain a Multi-Mull installation.

Consider: *Connected Horsepower* per ton, per hour of capacity. Examine the graph at right. Then ask your own engineers what a Multi-Mull system could save you in power supply and control costs alone.



Data taken from Manufacturer's Published Bulletins.

MULTI-MULL ORDERS NOW EXCEED 14,000,000 TONS PER YEAR OF CAPACITY

After 3½ years of testing and development, the Simpson Multi-Mull was formally introduced to our industry at the 1960 Foundry Show. Now, only a year later, over 14 million tons of annual capacity in this new continuous muller has been sold.

Why has Multi-Mull gained this wide and immediate acceptance by the country's most technically advanced foundries? There are three reasons. They add up to one fact which is significant to *all* foundrymen:

The Simpson Multi-Mull was developed for one purpose—to provide foundrymen with mulling equipment capable of *more economically* producing the *consistently* high quality sand required by advancing foundry technology. For this reason . . .

Foundrymen who are competitively waging the battle of profit vs. cost are "tooling up" with Simpson Multi-Mull.

Write for literature.

NATIONAL ENGINEERING COMPANY
646 Machinery Hall Building • Chicago 6, Illinois

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For More Information Circle 567, Page 87

extra care for longer valve life!

The bores of all Valvair Speed King® valves are processed to a surface finish of 20 microinches or better . . . stems are held to 10 microinches.

To maintain its established standards of surface finish, Valvair precision-machines, then hones every main valve bore . . . grinds, hard-chrome plates, then polishes each stem. Prior to assembly, bores and stems are checked with a surface measuring instrument to be absolutely certain that surface finish meets Valvair's rigid requirements.

This painstaking attention to product quality is one of the reasons for Valvair's products' multi-million cycle dependability and is your guarantee of Valvair performance and service life. If you stake your reputation on the design, construction or operation of air controlled machinery, can you afford to use less than the best . . . the most dependable control valve components? Your nearby Bellows-Valvair Field Engineer can tell you more about Valvair quality and versatility. Call him today. Or, for more information, write Bellows-Valvair, Akron 9, Ohio, Dept. FO-861.

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AKRON 9, OHIO

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

8174

LATE NEWS

CLOUDED CRYSTAL BALL: Outlines of the economic picture are hard to bring into focus at the moment. Forecasters and analysts are pretty much in agreement that recovery still is making progress, but gradually and spottily. Durable goods are picking up substantially, but they are below the levels of a year ago. Every indication is that the pickup will continue during the second half, although not with even emphasis in all areas. Automobile production, for example, undoubtedly will rise faster than appliance sales.

For castings, the last half is encouraging but still can't be pinpointed. Right now, plantwide vacations tend to produce a sagging situation, but the short-inventory policy which customers have been following should bring on a quick reaction later. April casting shipments were about the same as March's, and May, June, and July totals shouldn't be spectacularly different. By fall, however, the shape of the future should be visible.

IMC BUYS ARISTO: International Minerals & Chemical Corp., Skokie, Ill., has acquired Aristo Corp., Detroit manufacturer of foundry binders. IMC exchanged shares of its common stock for all the stock of Aristo, which will be operated as an IMC subsidiary.

CAST SHELLS: At a briefing for the press at Albion, Mich., on July 18, Maj. Gen. William K. Ghormley, commanding general, U. S. Army Ordnance Special Weapons-Ammunition Command, Dover, N. J., announced that Albion Malleable Iron Co. has developed a process

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1959	58,979,881	9,613,059	1,156,097	9,232,037
1960				
Mar.	6,639,885	839,016	106,749	971,864
3 mo.	20,146,061	2,484,934	299,879	3,043,411
Apr.	5,625,717	754,486	82,767	787,186
May	5,051,121	771,900	79,170	852,585
June	4,485,444	809,297	87,485	833,797
July	3,678,127	603,062	55,974	520,361
Aug.	4,217,562	692,470	78,788	697,243
Sept.	4,148,550	732,252	76,939	641,712
Oct.	4,375,871	742,039	71,862	675,356
Nov.	3,939,970	709,187	70,282	607,471
Dec.	3,738,385	669,250	66,438	601,274
Total	59,406,808	8,968,777	989,584	8,850,396
1961				
Jan.	4,059,361	654,353	65,434	646,999
Feb.	3,925,802	593,810	61,286	642,853
Mar.	4,449,078	677,617	73,544	710,749
3 mo.	12,434,241	1,925,780	200,264	1,900,601

Index of Foundry Equipment Orders

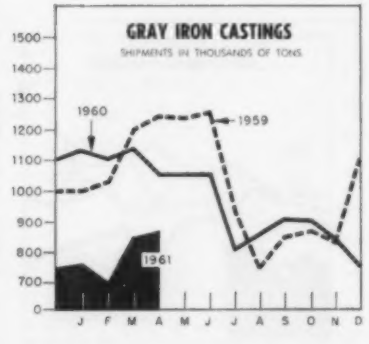
Foundry Trades Only

(Net Orders Closed, New Equipment)

	1960	1961
Jan.	95.5	123.7
Feb.	128.6	81.8
Mar.	159.9	99.1
Apr.	97.9	115.2
May	159.0	101.5
June	164.8	....
July	80.0	....
Aug.	92.4	....
Sept.	158.1	....
Oct.	81.7	....
Nov.	106.5	....
Dec.	101.2	....

Note: Base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons[1])

	All Castings — Total	All Castings — For Sale	Miscellaneous Total	Miscellaneous For Sale	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total[2]	Soil Pipe & Fittings Total[2]	Unfilled Orders[2]
1959	12,307,798	6,994,200	7,451,925	3,247,389	173,433	2,142,498	309,945	1,440,883	862,547	.....
1960										
Apr.	1,051,700	580,931	609,577	259,335	14,323	232,895	21,737	118,886	68,605	834,495
4 mo.	4,439,100	2,344,742	2,651,707	1,100,534	63,718	1,007,949	82,457	365,137	231,850	.....
May	1,052,798	585,770	613,745	257,180	13,126	207,094	20,414	136,455	75,090	781,596
June	1,049,638	601,597	622,236	273,148	15,010	183,049	19,510	144,773	79,770	719,564
July	803,308	450,580	478,269	202,347	10,694	120,784	16,226	120,652	67,375	754,789
Aug.	858,503	540,395	490,059	238,561	15,675	131,428	14,221	139,275	83,520	712,784
Sept.	900,497	527,227	554,788	245,887	14,616	125,688	13,460	135,327	71,234	695,325
Oct.	905,139	500,054	565,869	238,249	12,859	139,977	12,559	117,009	66,725	646,852
Nov.	825,709	454,611	538,817	230,022	11,570	123,054	12,410	102,959	58,469	568,974
Dec.	748,821	394,981	506,979	219,525	12,097	107,559	12,306	73,959	48,018	552,813
Totals	11,593,511	6,402,957	7,025,469	3,055,453	169,853[3]	2,246,582	203,863	1,338,846	782,051	.....
1961										
Jan.	760,136	406,315	504,182	222,508	11,874	123,277	11,847	69,881	59,940	599,776
Feb.	702,413	378,252	465,654	209,207	11,184	116,563	7,403	66,541	46,252	620,623
Mar.	856,491	496,928	509,932	232,384	12,193	155,545	9,090	110,792	71,132	651,696
Apr.	869,233	503,634	515,664	225,966	15,910	148,899	9,208	121,867	73,595	645,412
4 mo.	3,188,273	1,785,129	1,795,432	890,065	51,161	544,284	37,548	369,081	241,928	.....

Source: U. S. Dept. of Interior, Bureau of Mines. [1]Source: Bureau of the Census. [2]For sale only. [3]All cast iron pipe is shipped for sale. [4]Gray iron total includes nodular iron. [5]Monthly figures do not add up to total shown because of unreported monthly revisions.

to cast shell from pearlitic malleable iron, replacing forged steel. A $935,000 contract for production of 173,800 rounds of 81-mm mortar shell has been awarded that company.

CLOSES FOUNDRY: American Motors Corp. will close its gray iron foundry at Kenosha, Wis., at the end of this model run (July 28), pending studies on future foundry approaches. Because of developments in new techniques of aluminum and iron engine production, AMC management wants maximum flexibility in foundry operations.

It is rumored that AMC will purchase its gray iron castings at International Harvester Co.'s foundry at Louisville, Ky., until such time as the AMC foundry may be reopened in the future at Kenosha or at some other location.

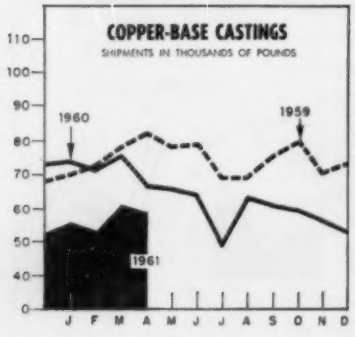
DROPS MALLEABLE: Superior Steel & Malleable Castings Co., Benton Harbor, Mich., will discontinue production of malleable iron castings on Sept. 1, 1961, or as soon before then as orders on hand have been processed. Superior, which has spent about $3¾ million on expansion and improvement of its Steel Foundry Div. during the last year, will retain the engineering, technical, and sales staffs of the Malleable Div.

WHELAND IS MERGED: Wheland Co., Chattanooga, Tenn., has been merged into Gordon Street Inc., which has owned a majority of Wheland stock for a number of years. The Broad Street and the Signal Mountain Road plants will be known, respectively, as Wheland Foundry and Wheland Products, each a division of Gordon Street Inc. No change in policies or products in planned.

TAX EXEMPTION: The AFS Training & Research Institute, Des Plaines, Ill., reports that it has been designated a tax-exempt organization by the Treasury Department.

PERSONALS: Griffin Pipe Div., Griffin Wheel Co., a subsidiary of American Steel Foundries, Chicago, has appointed Frank Marold vice president and general manager and W. R. Colton sales manager . . . Harold R. Skeels has been named manager, Materials Dept., Bartlett-Snow Div., Bartlett-Snow Pacific Inc.,

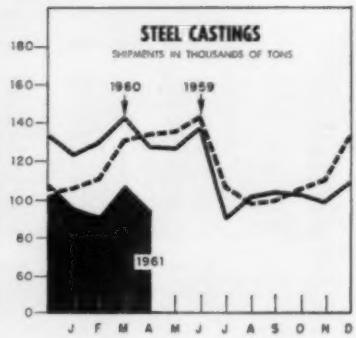
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments			
	Total	Sand	Perm. Mold	Unfilled Orders[2]
1959	871,032	765,246	52,456	.....
1960				
Apr.	66,777	58,453	4,523	27,423
4 mo.	288,453	253,815	16,920	.....
May	66,299	57,848	4,463	24,582
June	64,585	56,441	3,715	21,781
July	48,399	42,778	2,910	22,367
Aug.	63,765	56,344	3,669	21,915
Sept.	61,362	54,104	3,699	21,063
Oct.	59,877	52,734	3,556	22,008
Nov.	56,358	50,043	3,132	21,261
Dec.	53,009	46,237	3,369	21,914
Total	762,107	670,344	45,443	.....
1961				
Jan.	55,875	48,928	3,286	22,792
Feb.	53,457	47,156	2,615	22,065
Mar.	61,277	53,302	3,414	20,965
Apr.	58,812	51,159	3,500	22,723
4 mo.	229,424	200,545	12,815	.....



STEEL CASTINGS—SHIPMENTS

(Net tons[1])

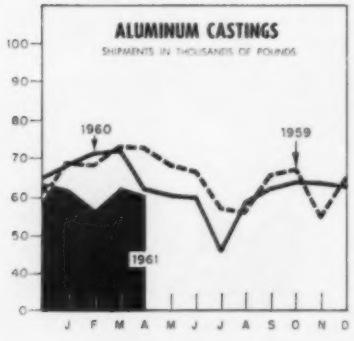
	All Castings			Carbon			Alloy			
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Unfilled Orders[2]
1959	1,412,885	1,112,668	210,984	1,043,538	814,219	194,201	369,347	308,449	16,783	.....
1960										
Apr.	127,219	96,577	22,828	93,433	70,251	21,253	33,786	26,306	1,575	248,902
4 mo.	522,751	398,244	91,094	388,260	292,784	85,754	134,491	105,440	5,340	.....
May	126,580	97,231	23,890	93,700	71,808	22,421	32,880	25,423	1,469	252,293
June	136,922	107,076	26,389	101,294	78,601	24,707	35,698	28,475	1,682	233,765
July	89,565	67,294	13 430	63,753	47,570	12,804	25,812	19,724	626	223,880
Aug.	101,709	77,146	14,619	73,338	55,099	13,713	28,371	22,047	906	213,611
Sept.	104,298	79,556	14,171	74,447	56,126	13,273	29,851	23,430	898	199,413
Oct.	102,664	79,622	14,586	72,544	57,879	13,544	30,120	21,743	1,042	186,311
Nov.	99,577	78,305	15,768	69,927	56,466	14,113	29,650	21,839	1,655	174,317
Dec.	108,249	87,417	24,849	78,805	64,997	22,295	29,444	22,420	2,554	162,882
Total	1,392,385	1,071,871	238,796	1,016,068	781,330	222,624	376,317	290,541	16,172	.....
1961										
Jan.	96,190	76,650	11,534	68,795	56,592	10,550	27,395	20,058	984	156,683
Feb.	92,602	71,907	9,128	64,849	51,209	7,818	27,753	20,698	1,310	145,024
Mar.	107,275	82,522	11,342	75,728	59,239	10,068	31,547	23,283	1,274	143,589
Apr.	93,978	71,027	5,414	65,844	49,763	4,381	28,134	21,264	1,033	147,234
4 mo.	390,045	302,106	37,418	275,216	216,803	32,817	114,829	85,303	4,601	.....

[1]Source: Bureau of the Census. [2]For sale only.

Cleveland . . . Fred E. Kasch has been appointed assistant director, Gray Iron Research Institute Inc., Columbus, Ohio . . . B. H. Regenburg has been named president and general manager, Belle City Malleable Iron Co. and Racine Steel Castings Co., Racine, Wis. C. S. Anderson, former chief executive officer, now is board chairman, and R. J. Swartout, former president, has retired . . . Fred R. Geiser has been elected president, Cincinnati Steel Castings Co., Cincinnati, succeeding the late Leonard Geiser. Robert S. Ragen becomes vice president . . . George Walther Jr. has been named president, Dayton Steel Foundry Co., Dayton, Ohio, succeeding his father, the late George Walther Sr. . . . Michael Keimel has become a sales representative for the Equipment Div., Milwaukee Chaplet & Supply Corp., Milwaukee . . . Anton Dorfmueller Jr. has been appointed manager in the east central and middle Atlantic states for the Chemical Group, Archer-Daniels-Midland Co., Minneapolis. He continues as manager of ADM's Federal Foundry Supply Div., Cleveland.

OBITUARY: Harold R. Saurer, 61, chief metallurgist, Dayton Malleable Iron Co., Dayton, July 9 . . . Herbert V. Hites, 66, retired quality product engineer, Ohio Steel Foundry, Springfield, Ohio, died July 1.

MISCELLANY: Cleveland Industries Inc., 887 E. 67th St., Cleveland 3, Ohio, has been formed to produce replacement wear parts for all commonly used abrasive blast cleaning equipment; complete abrasive blast cleaning systems; and specialized equipment related to the abrasive cleaning and foundry fields . . . Mathews Conveyer Co., Ellwood City, Pa., has purchased the Wilkie Co., Philadelphia manufacturer of telescopic roller, wheel, and belt conveyors . . . Extensive fires recently struck Homer Foundry Corp., Coldwater, Mich., and Molders Foundry Co., Lowell, Mass. . . . Detroit Mold Engineering Corp., Detroit, has changed its name to D-M-E Corp. . . . J. B. Williams Co., producer of toilet goods and pharmaceuticals, has acquired Landers, Frary & Clark, Connecticut manufacturer of electrical and household appliances. Landers, Frary & Clark operate a gray iron foundry in New Britain, Conn., and a Republic Die Casting Div. at Fort Smith, Ark. . . . Aluminum Co. of America is moving its Detroit diecasting work to Cleveland.



PRODUCTION WORKERS

Estimated Number

	Apr. 1961	Mar. 1961	Apr. 1960
Ferrous	167,500	167,800	194,000
Nonferrous	43,900	44,000	51,200

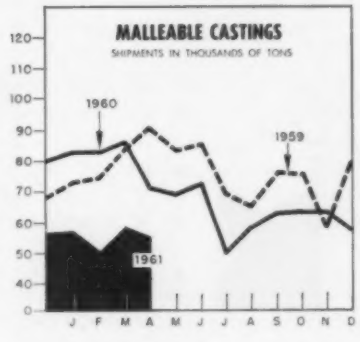
Average Weekly Earnings

Gray Iron	94.35	92.50	93.59
Malleable Iron	93.87	92.88	92.16
Steel	100.97	101.23	101.27
Nonferrous	103.57	102.00	97.32

Average Weekly Hours

Gray Iron	38.2	37.6	38.2
Malleable Iron	37.7	37.3	38.4
Steel	38.1	38.2	39.1
Nonferrous	40.3	40.1	39.4

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments Total	Sand	Perm. Mold	Die	Unfilled Orders[2]
1959	786,399	141,987	274,855	368,101	.....
1960					
Apr.	61,797	12,339	19,950	29,400	75,243
4 mo.	273,959	48,351	88,345	136,840	.....
May	60,330	10,682	21,507	28,055	75,977
June	60,065	11,280	20,953	27,722	74,699
July	45,694	8,765	15,804	20,973	76,434
Aug.	58,848	10,639	18,901	29,256	75,230
Sept.	62,116	10,514	22,031	29,527	75,144
Oct.	63,750	10,149	23,339	30,213	71,364
Nov.	63,408	9,901	23,612	29,831	73,032
Dec.	63,629	9,578	23,272	30,677	71,398
Total	751,802	129,859	257,764	363,094	.....
1961					
Jan.	60,774	10,210	21,821	29,904	63,729
Feb.	57,144	10,183	19,518	27,355	62,748
Mar.	62,518	10,715	21,454	30,246	62,883
Apr.	60,282	10,037	21,065	29,096	65,322
4 mo.	240,524	41,145	83,858	116,601	.....

[1]Source: Bureau of the Census. [2]For sale only.

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[1])

	Shipments Total	For Sale	Standard Total	For Sale	Pearlitic Total	For Sale	Unfilled Orders[2]
1959	916,362	557,303	729,868	449,946	186,494	107,357	.....
1960							
Apr.	71,271	39,059	56,136	32,066	15,135	6,993	79,237
4 mo.	323,820	181,970	261,352	145,812	72,468	36,158	.....
May	68,942	37,618	53,108	30,126	15,834	7,492	73,240
June	72,593	43,105	55,956	34,526	16,637	8,579	63,920
July	49,860	28,575	37,187	22,477	12,673	6,098	74,329
Aug.	58,785	36,765	46,522	29,077	12,263	7,688	69,853
Sept.	63,048	36,114	48,635	28,623	14,413	7,491	69,033
Oct.	63,521	35,492	47,932	27,813	15,589	7,679	56,616
Nov.	62,978	35,432	47,571	27,611	15,407	7,821	55,627
Dec.	57,154	31,500	43,319	24,729	13,835	6,771	54,657
Totals	820,701	466,571	631,582	370,794	189,119	95,777	.....
1961							
Jan.	57,697	34,064	43,778	27,104	13,919	6,960	52,171
Feb.	50,828	29,675	39,358	23,854	11,470	5,821	47,703
Mar.	58,464	33,531	45,747	26,711	12,717	6,820	45,477
Apr.	55,590	31,436	43,192	25,152	12,402	6,284	48,098
4 mo.	222,579	128,706	172,075	102,821	50,508	25,885	.....

Prices of Foundry Metals and Coke

(As of July 21, 1961)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$18.00-$18.50

OVENS

Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearny, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Boston, dald.	77.79	78.29
Buffalo	66.50	67.00
Chester, Pa.	Nom.	Nom.
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 32.00; tin bronze, No. 225, 41.25; No. 245, 35.75; high-leaded tin bronze, No. 305, 36.00; No. 1 yellow, No. 405, 27.50; manganese bronze, No. 421, 31.25.

ALUMINUM: Primary alloy No. 13, 25.90; No. 43, 26.20; No. 195, 27.60; No. 214, 29.00; No. 356, 26.80; secondary No. 12 alloy, 21.75-22.25. Deoxidizing grades: No. 1, 23.25; No. 4, 20.00.

MAGNESIUM ALLOY: AZ91A, 40.75; AZ63A, AZ92A, AZ91C, 40.75, f.o.b. Velasco, Tex.

COPPER: Electrolytic 31.00, delivered Connecticut valley.

ZINC: High grade, 12.35, delivered. Die casting alloy No. 3, 13.75; No. 2, 14.25, delivered.

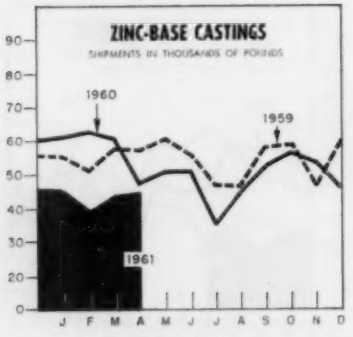
Iron and Steel Scrap

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Machinery, Cast	Structurals, Plates	Malleable	Short Steel Rails
Birmingham	$37.00-38.00	$42.00-43.00	.....	.....	$42.00-43.00	.....	$46.00-47.00
Boston*	**28.50-29.00	**39.00-40.00	.....	**$40.00-42.00	.....	.....	.....
Buffalo	31.00-32.00	**37.00-38.00	.....	.....	39.00-40.00	.....	48.00-49.00
Chicago	37.00-38.00	41.00-42.00	.....	43.00-47.00	43.00-44.00	$47.00-48.00	49.00-51.00
Cincinnati*	**32.00-33.00	**34.00-35.00	**$28.00-29.00	**46.00-47.00	.....	.....	**47.00-48.00
Cleveland	35.00-36.00	39.00-40.00	28.00-29.00	48.00-49.00	39.00-40.00	47.00-48.00	48.00-49.00
Detroit*	32.00-33.00	32.00-33.00	26.00-27.00	.....	.....	.....	.....
Los Angeles	40.00-42.00	44.00-46.00	.....	.....	.....	.....	.....
New York*	30.00-31.00	34.00-35.00	31.00-32.00	.....	32.00-33.00	.....	.....
Philadelphia	39.00	40.00	40.00	49.00-50.00	43.00-44.00	49.00	51.00-53.00
Pittsburgh	35.00-36.00	**34.00-35.00	.....	45.00-46.00	41.00-42.00	.....	50.00-52.00
St. Louis*	34.00	37.00	32.00	.....	.....	.....	43.00
San Francisco	43.00	46.00	28.00	45.00-46.00	.....	.....	.....
Seattle	44.00-45.00	42.00	39.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point.

Foundry Statistics



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1959	631,210	443,009	.....
1960			
Apr.	47,553	31,423	56,312
4 mo.	242,891	152,907	.....
May	50,844	33,551	56,654
June	50,809	34,264	51,960
July	35,117	25,186	52,392
Aug.	45,101	32,549	57,551
Sept.	52,514	34,451	57,480
Oct.	56,206	36,459	57,028
Nov.	53,574	33,758	55,306
Dec.	46,208	29,341	51,516
Totals	823,203	412,466	.....
1961			
Jan.	46,011	30,311	50,940
Feb.	39,946	26,715	45,453
Mar.	44,130	29,724	43,921
Apr.	44,853	30,225	47,853
4 mo.	174,940	116,975	.....

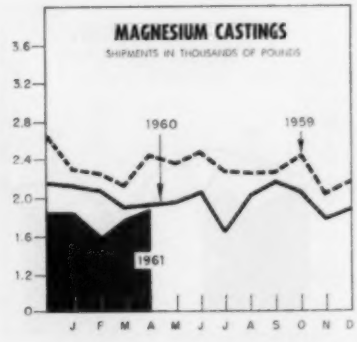
PIG IRON

PRODUCTION**—Net Tons

	Foundry	Malleable & Silvery	Low & Int. Low Phos. & Bessemer
1959	1,889,445	2,810,359	3,471,683
1960			
May	135,825	290,057	356,931
5 mo.	673,161	1,545,708	2,150,142
June	105,717	247,991	309,942
July	117,218	166,684	290,384
Aug.	78,950	171,718	211,506
Sept.	93,260	202,895	152,880
Oct.	133,525	183,639	208,758
Nov.	122,550	231,203	206,062
Dec.	130,455	153,009	202,353
Totals	1,454,836	2,902,247	3,732,027
1961			
Jan.	106,054	165,571	170,224
Feb.	98,207	144,476	214,396
Mar.	101,306	159,529	222,688
Apr.	114,050	150,322	189,779
May	118,211	166,365	215,093
4 mo.[3]	539,364	786,263	1,012,180

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1959	3,989,129	223,868	351,355
1960			
Mar.	317,520	21,042	43,959
3 mo.	966,822	58,933	132,778
Apr.	282,178	16,796	36,971
May	292,407	15,730	19,869
June	313,340	16,828	23,720
July	241,752	11,892	21,123
Aug.	273,722	14,697	27,919
Sept.	284,809	13,548	19,962
Oct.	269,103	13,631	13,947
Nov.	254,799	12,867	17,567
Dec.	233,592	12,722	18,344
Totals	3,412,524	187,644	331,200
1961			
Jan.	232,051	13,293	16,375
Feb.	225,222	12,195	21,705
Mar.	251,524	13,922	18,646
3 mo.	708,797	39,410	56,726

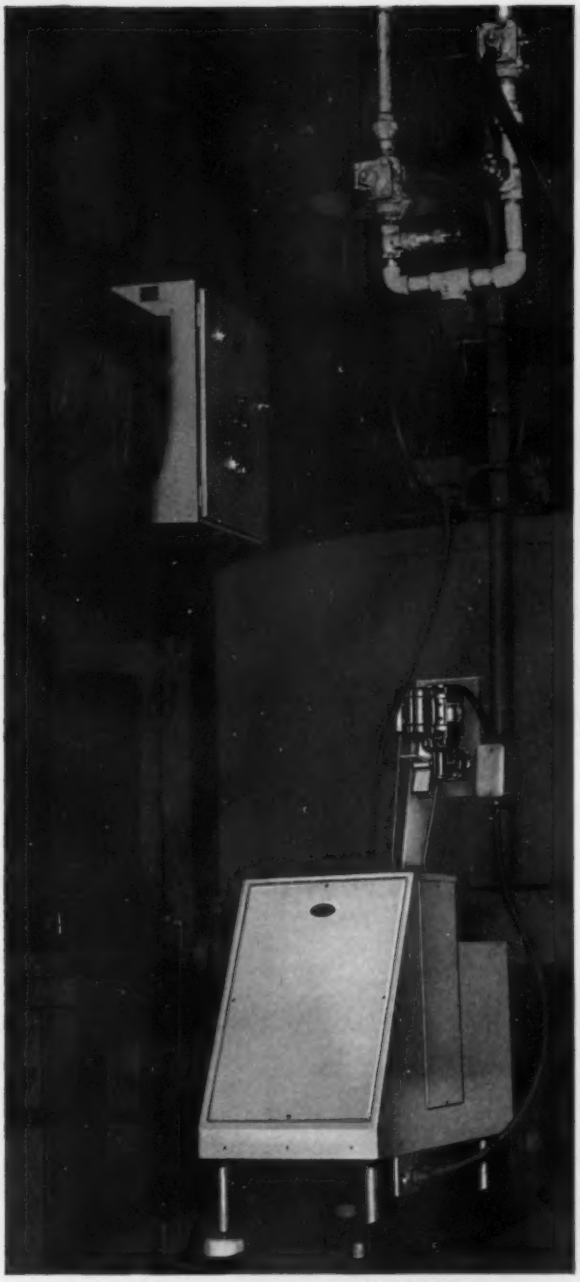


MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1959	27,253	23,100	.....
1960			
Apr.	1,926	1,533	3,138
4 mo.	8,039	6,324	.....
May	1,953	1,514	2,948
June	2,050	1,555	3,396
July	1,638	1,234	3,541
Aug.	2,025	1,530	3,364
Sept.	2,148	1,653	3,271
Oct.	2,038	1,519	3,274
Nov.	1,776	1,269	3,433
Dec.	1,875	1,345	3,156
Total	23,540	17,943	.....
1961			
Jan.	1,862	1,436	2,847
Feb.	1,610	1,206	2,770
Mar.	1,791	1,360	2,476
Apr.	1,886	1,516	2,888
4 mo.	7,149	5,518	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For Sale only. [3]Monthly figures may not add up to totals shown because of unreported monthly revisions.



THE DIETERT-DETROIT MOLDABILITY CONTROLLER receives a small sample of sand continuously from the mixer. This is fed onto the trough of the controller. The moldability or workability of the sample is reflected in the amount of sand passing through a screen as measured by the moldability controller. Water is added only to reach the desired level of moldability. The amount of water will vary, dependent upon the changing physical properties of the sand.

Are you still struggling to control moldability with a FISTFUL of SAND?

THE MOLDABILITY CONTROLLER, by Dietert-Detroit, forever eliminates this old fistful-of-sand technique . . . *enabling every modern foundry to maintain constant moldability—hour after hour, around the clock.*

OPERATION is based on an entirely new approach to moldability control. It is simply this . . .

> **WATER ADDITIONS** to the sand are automatically adjusted to maintain a *predetermined physical property*—rather than a constant moisture level. The sand is controlled to constant moldability, *water being only one component* of the sand in process.

Since this unit controls the water addition to maintain a constant physical property rather than constant moisture, it has remarkable tolerance for variations in composition and in the amount of additives. It is designed to produce sands that will mold uniformly throughout the day, despite significant variations in the composition of the system sand, under normal plant practice.

THERE ARE NO PROBES, thermocouples, or temperature sensing bulbs in the mixer, no electronic circuits, no maintenance problems and no moisture juggling.

This new moldability control system results in a more profitable operation with much less supervision.

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Send me complete details on your New Moldability Controller.

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TITLE_____
COMPANY_____
ADDRESS_____
CITY_____ STATE_____

For More Information Circle 569, Page 87

Ansco

SUPERPAK®

makes everybody's job easier!

New bulk-packaging of Ansco Industrial X-ray Film Saves storage space... Makes film handling surer, easier... Fits standard storage bins... Cuts film costs!

Two forms of the new Superpak package are available to Ansco Industrial X-ray film users. Illustrated here in the popular 3½ x 17 inch size. Both the Superpak '300' and Superpak '600' shipping cartons have the same outside dimensions. In the '300' package, each of the four inner cartons contains 75 sheets of film packed *with interleaving paper*. In the '600' package, each inner carton contains *twice* as much film—150 sheets—packed *without* interleaving paper.

Both packages bring the dependable performance of Ansco Industrial X-ray films to the industrial user in a more convenient and economical form. Ansco, Binghamton, N. Y.

Ansco

X-ray

For More Information Circle 570, Page 87

BIG BELT: P. W. Perdriau, president of B. F. Goodrich Industrial Products Co., Akron, Ohio, stands beside a giant roll of rubber conveyor belt destined for the Climax, Colo., plant of Climax Molybdenum Co. It's 14 ft in diam, weighs 39,210 lb, and contains 2543 ft of 42-in. wide belt which will haul molybdenum ore overland from the company's mine to the crushing plant, where it is processed

AFS and Unions Agree on Ground Rules for Foundry Congress

Representatives of American Foundrymen's Society, City of Detroit, and all major labor unions involved have signed an agreement providing ground rules for installing, dismantling, and operation of AFS's International Foundry Congress in Cobo Hall, Detroit, from May 7 through 11, 1962.

The rules are designed to establish indisputable authority and responsibility for all services and costs. They automatically become a part of the contract between Cobo Hall and AFS for the congress, which will be the largest industrial exposition ever staged in the new hall.

The agreement was signed for AFS by the society's president A. L. Hunt, Superior Foundry Inc., Cleveland. Mayor Louis C. Miriani, and S. T. Kish signed for the city, and L. M. Wier, D. Diamond, and T. McNamara signed for the labor groups.

Malleable Machinability Tested

New data on machining characteristics of malleable iron castings are reported to indicate that ferritic grades can be machined easier and faster than many free-cutting steels and that hardness values are not adequate indicators of malleable's machinability.

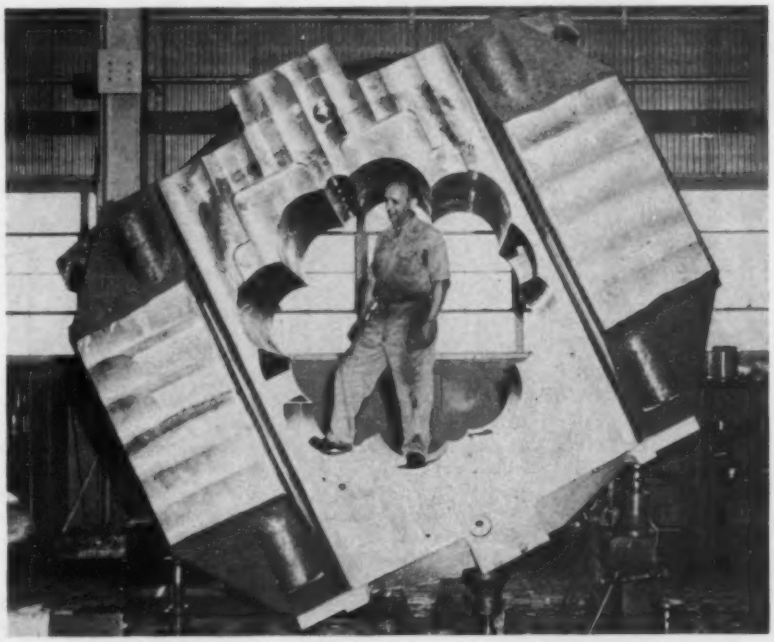
Tests were conducted by Metcut Research Associates, Cincinnati, for Malleable Founders Society, Cleveland, to provide information on turning four grades of the material and to show how it compared as a machine workpiece against others in its strength and hardness range. Data were developed for tool life, cutting speed, and depth of cut and tool geometry for surface roughing cuts, under-the-skin roughing cuts, and finish cuts.

Samples used were hollow test cylinders of approximately 4 in. ID and 12¾ in. long. Grade K-6 carbide tooling was selected for the series along with a soluble cutting oil mixed in the ratio of one to 20 with water.

In a comparison of three grades of pearlitic malleable iron with nodular and gray irons of similar hardness, it was found that grade 80002 pearlitic malleable had better machining characteristics, grade 48004 pearlitic malleable was about equal, and grade 60003 pearlitic malleable was below the other materials in machinability. Use of cutting oils during turning of the harder grades of pearlitic malleable was found to be less significant than with ferritic malleable.

Grade 32510 ferritic malleable was found to rate better than annealed nodular iron, two grades of free cutting steel, and a common grade of gray iron. It was also

(*Concluded on Page* 26)



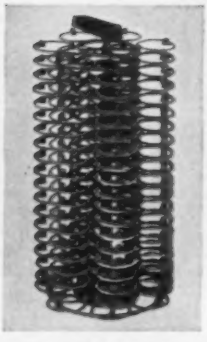
80 TONS OF STEEL: This massive, 80-ton steel casting, framing a 5-ft-6-in. man, was cast at Pittsburgh Steel Foundry, a division of Textron Inc., to house the rolls of a Sendzimir mill built to roll the new thin tinplate now being produced by the steel industry. The mill was built by Waterbury Farrel Foundry & Machine Co., another Textron division

Cast iron parts, produced by Perfect Circle's unique casting techniques, are used in critical wear points in both cast iron and non-ferrous engines. Cylinder liners are centrifugally cast, piston inserts and rings are produced by the stacked mold process. Gray iron valve guides are virtually a must for engines with non-ferrous cylinder heads. In each case, Republic Pig Iron is the base metal. Simple economics dictate the use of cast iron parts to resist wear at critical points.

REPUBLIC PIG IRON SPECIFIED FOR STACKED MOLD, CENTRIFUGAL CASTING

Uniform Chemistry, High Quality are Ideal for Unique Processes

In these two casting processes—stacked mold and centrifugal—Perfect Circle Corporation maintains stringent quality control programs. Control begins with the selection of pig iron. To suit Perfect Circle's metallurgists, the iron must have a perfectly uniform chemical composition with exact graphite distribution, and be of consistent high quality. To produce the gray iron parts on the opposite page, by the casting methods described below, Perfect Circle selected Republic Pig Iron as the base metal.



STACKED MOLD

In this process, stacks of green sand molds move along conveyors to the pouring station. Metal may come direct from a cupola or from an electric furnace. As the stacks cool they move to the shake-out station, where the cast "Christmas trees" are lifted and shaken free of the copes and sand.

By this process, Perfect Circle is able to produce several hundred castings at one pour. Dimensions are limited only by the depth and diameter of the cope.

CENTRIFUGAL

This process begins with installation of a permanent mold into a spinner where it is heated, spun to an interior force of 120 gravities, and coated. A measured weight of metal is poured into the mold. Through precise control of the mold temperature and the coating, the cooling rate is regulated to produce the desired microstructure. The spinning process squeezes gases and nonmetallic impurities out of the metal, and continues until the casting temperature drops to 1500°–1700°. The finished casting is then removed.

The castings are end-cropped to length and machined. The process allows a significant reduction in scrap loss, stock removal allowances, machining time, and costs.

REPUBLIC'S COMPLETE FOUNDRY ENGINEERING SERVICE is available to all foundries without obligation. Republic Foundry Service Engineers can supply ideas, suggestions, and information to benefit every department of your foundry operation. They can recommend, from industry's most complete line of merchant pig iron, the grade best suited to your requirements: Chateaugay; Northern Foundry, Malleable, Bessemer and Basic; Southern Malleable, Foundry and Basic.

REPUBLIC STEEL

PRODUCER OF INDUSTRY'S MOST COMPLETE LINE OF MERCHANT PIG IRON

REPUBLIC STEEL CORPORATION
DEPT. FO-2272
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

☐ Have a Foundry Service Engineer call.
☐ Send more information on Republic Pig Iron.

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____

For More Information Circle 571, Page 87

(*Concluded from Page 23*)

found that use of a cutting fluid with this grade can increase efficiency by as much as 30 per cent and that cutting speeds can be increased by approximately 50 per cent each step in machining, from skin-roughing cuts to under-skin roughing cuts to light finish cuts.

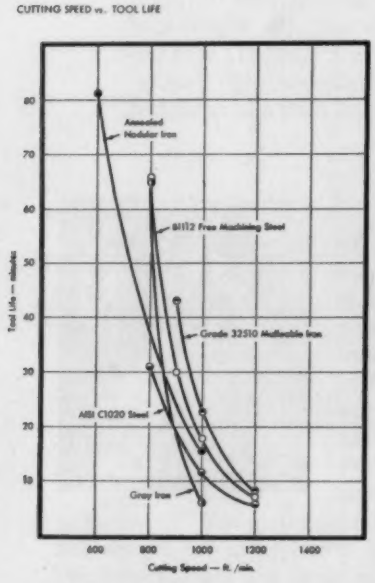
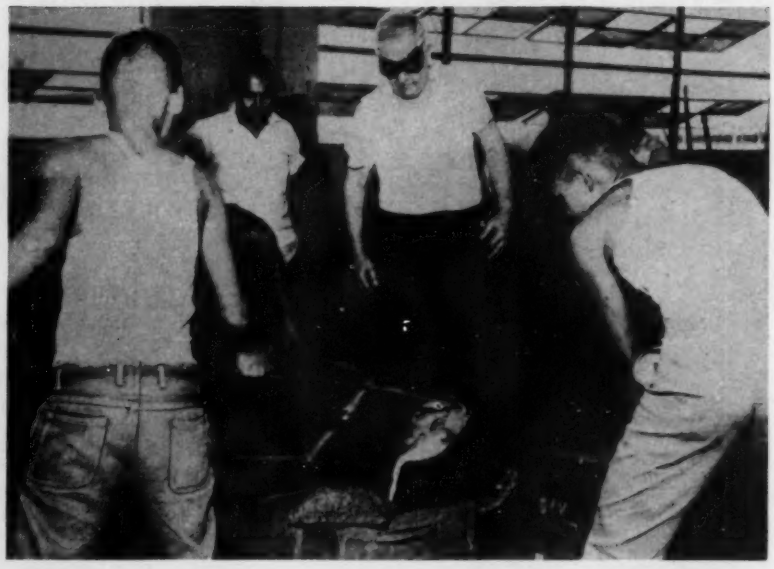


Chart compares tool life vs cutting speed for a number of ferrous metals

NEW IBF PRESIDENT: Recently installed as president of the Institute of British Foundrymen was D. A. Richards, shown here (left) with Mrs. Richards and Lord Mills, a prominent British industrialist, at the banquet of the IBF conference at Cheltenham, England. For a complete report of the proceedings, see p. 124 of this issue

Filipinos Learn Foundry Practice



Edwin W. Doe Sr. directs pouring of iron at school foundry in Philippines

AN OIL DRUM CUPOLA is the pride of Bataan National School of Arts and Trades in Balanga, capital city of Bataan Province in the Philippines. The school has a small foundry as part of its facilities for providing trade and industrial education.

Helping out at the school is Edwin W. Doe Sr., Belmar, N. J., who is a trade and industry education advisor at the U. S. International Cooperation Administration mission in Manila. Mr. Doe arrived in Manila in March, 1959, after six years of Mutual Security Program work in Brazil and Colombia. He previously spent 30 years as a trade school teacher and supervisor in New York City.

Essentially a foundry technician, Mr. Doe found that the foundry facilities, including the cupola, needed only a bit of modernizing. Within two months, school authorities had changed the machine and metal trades program to insure a smooth flow of jobs from drawing boards, to patternmakers, to the foundry, and finally to the machinists. The school has conducted seminars on patternmaking and foundry operations with measurable success. It keeps machinery in operating condition by making its own replacement parts and all hand tools.

Presently, the school has nine buildings, an enrollment of 508, and a faculty of 27. Mr. Doe believes that it can make a lasting contribution to Philippine progress through its foundry course. He points out that foundry work is a basic industry, one necessary to full development of the Philippines. Especially needed are jobbing shops to meet specific demands of local industries.

Missouri Valley Conference Will Be Held Sept. 21-22

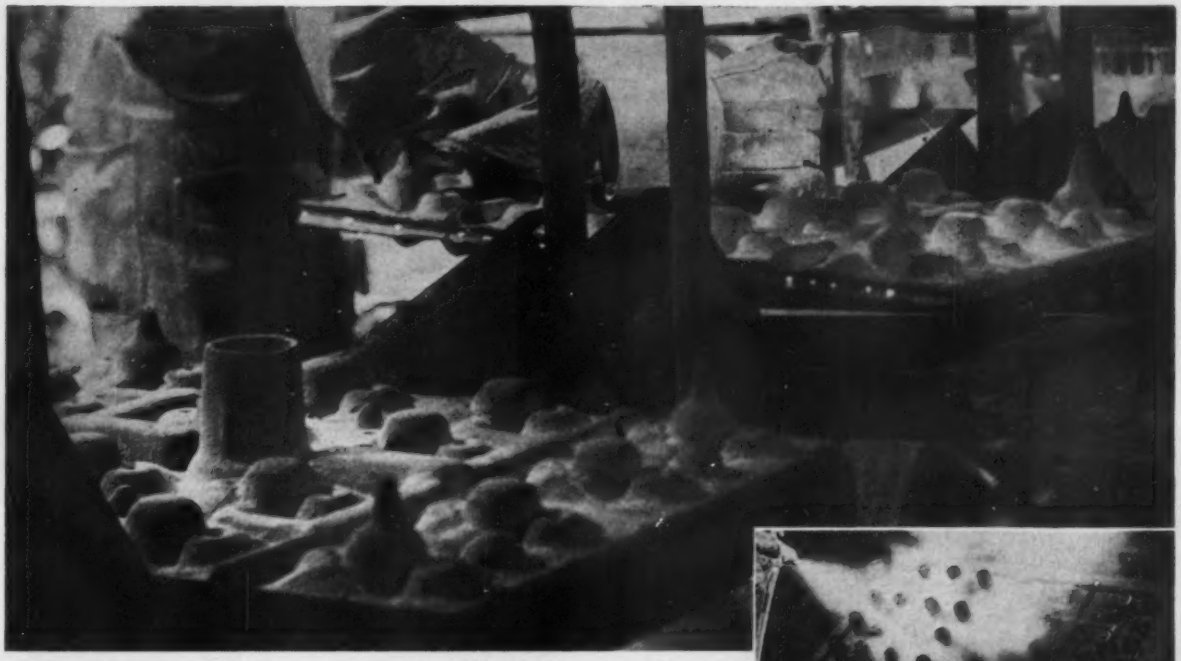
The 1961 Missouri Valley Regional Conference of the American Foundrymen's Society at Missouri School of Mines, Rolla, Mo., Thursday and Friday, Sept. 21-22, will feature a new educational shop course. Program details follow:

Thursday, Sept. 21

8:30 a.m.—Registration.
9:45 a.m.—General Sessions: "New Develop-

SILICONE NEWS from Dow Corning

A Complete Shell-Out!



Silicones Help Shell Molders Stop Sticking, Speed Production

Don't let sticking slow your shell-mold production . . . nor step up scrap, or delay production schedules. Shelve your sticky problems permanently by using Dow Corning 8 Emulsion. Assure yourself of clean, easy release, retention of detail and maintenance of close tolerances.

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The silicone release coating obtained with Dow Corning 8 Emulsion resists heat . . . doesn't flash off or evaporate at mold curing temperatures . . . doesn't carbonize. Build-up on patterns is kept to an absolute minimum. Patterns stay clean many cycles longer — you may even find fewer are needed.

Easy does it. Simply mix Dow Corning 8 Emulsion with water . . . in the ratio most suitable for your process and in the volume most practical for your production schedule. Then, apply the mix by dip, brush or spray. The emulsion's stability and fast wetting action produce a uniform film that gives overall, easy release and provides excellent surface finish.

Technical service . . . fast delivery . . . lowest price! Dow Corning's constant research and development in silicone chemistry means our customers receive the newest and the best possible silicone products at lowest price. Phone or write the Dow Corning office nearest you for prompt technical assistance, or for fast delivery from warehouse stocks.

Write for "how-to-do-it" manual describing use of silicone parting agents in shell-molding. Address Dept. 5120

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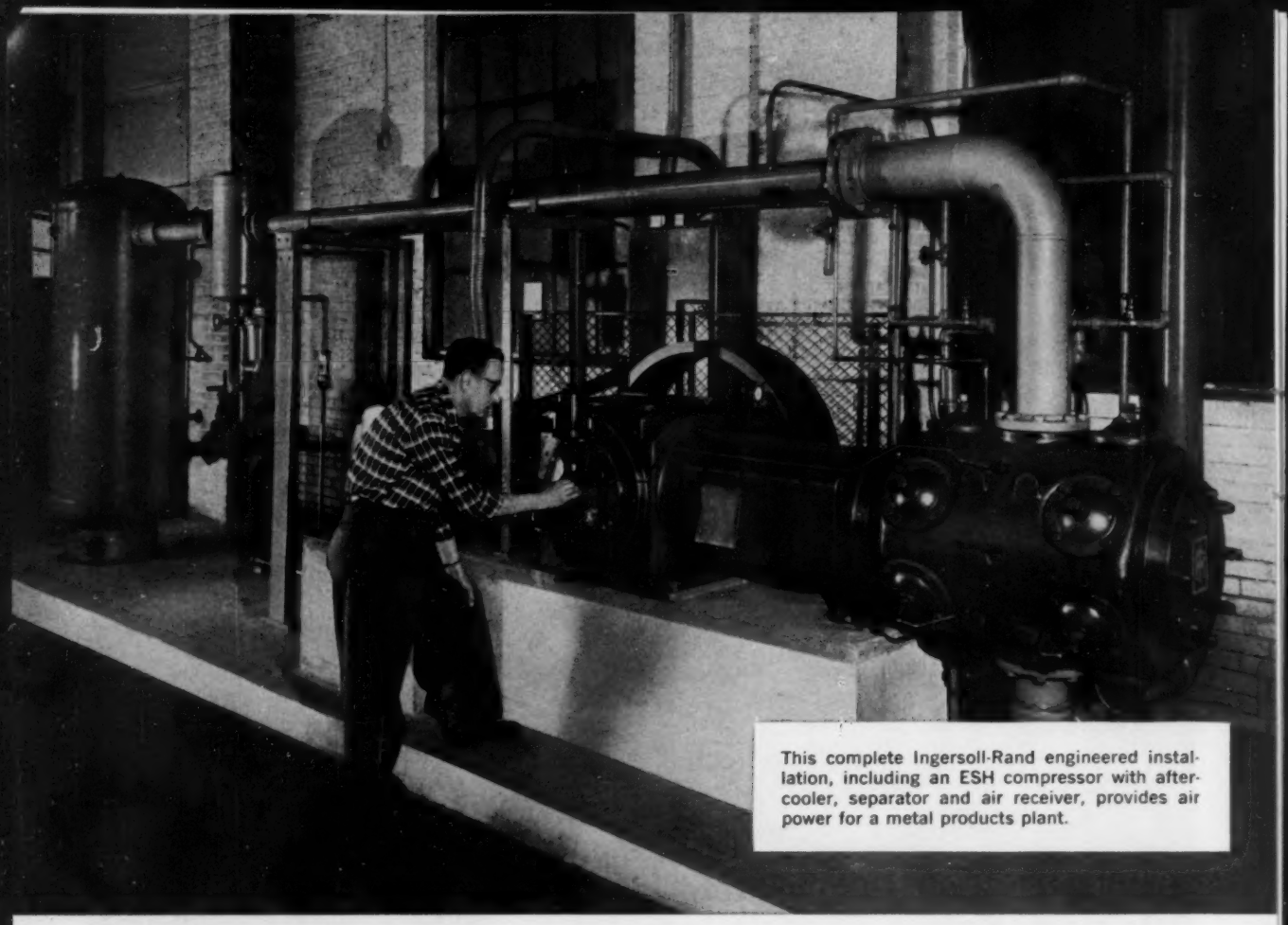
For More Information Circle 572, Page 87



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Here's why

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"No bearing wear in 60,000 hours"..."43,680 hours with no valve maintenance required"..."63,648 hours with no forced maintenance"..."13 years without even *cleaning* the valves". That's what our customers have been telling us, and there are many more true case histories like them which prove the *long-range economy* of Ingersoll-Rand compressors.

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20 to 150 hp	75 and 100 hp	125 to 350 hp	400 to 2000 hp	200 to 4000 hp	(steam-driven) 200 to 1500 hp

For More Information Circle 574, Page 87

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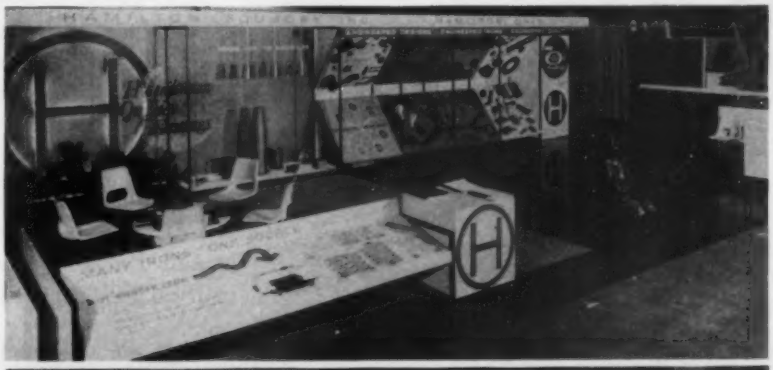
For More Information Circle 574, Page 87

ments in Foundry Practices," John A. Rassenfoss, American Steel Foundries.
12 Noon—Luncheon.
1:30 p.m.—Technical Sessions.
Steel: "Desulfurization of Steel," B. Gray, Air Reduction Co.
Iron: "Ductile Iron," Jeff Green, Sorbo-Mat Process Engineers.
Nonferrous: "High Quality Aluminum Castings," Alan B. DeRoss, Kaiser Aluminum & Chemical Co.
3:15 p.m.—Technical Sessions.
Steel: "Refractories for the Foundry Industry," Russell Pardee, Kaiser Aluminum & Chemical Co.
Iron: "Marketing of Engineering Irons in the Midwest and Southwest," Howard Randall, International Nickel Co.
Nonferrous: "ABC's of Molding Sand Practices," Clyde A. Sanders, American Colloid Co.
7:15 p.m.—Dinner.

Friday, Sept. 22

9 a.m.—Technical Sessions.
Steel: "New Developments in Core & Mold Making for the Steel Foundry," Victor M. Rowell, Archer-Daniels-Midland Co.
Iron: "New Core and Mold Processes for the Iron Foundry," A. Dorfmueller Jr., Archer-Daniels-Midland Co.
Nonferrous: "Control of Quality in the Brass Foundry," Fred L. Riddell, H. Kramer & Co.
10:45 a.m.—Technical Sessions.
Steel: "Sand for Molding and Coremaking," Thomas W. Seaton, American Silica Sand Co.
Iron: "Gating and Risering," H. Otey Merriweather Jr., Lynchburg Foundry Co.
Nonferrous: "New Developments in Core Practice," Robert Jacoby, St. Louis Coke & Foundry Supply Co.
12:15 p.m.—Luncheon: "The Dangerous Side of Sports," Bob Burnes (The Bench Warmer), St. Louis Globe Democrat.
2:00-3:30 p.m.—All groups Educational Shop Course & Demonstrations, Nondestructive Testing: George Mellow, Liberty Foundry Co., presiding; Prof. Robert V. Wolf, Metallurgical Engineering Dept., School of Mines & Metallurgy, speaker.



FOUNDRIES EXHIBIT AT DESIGN SHOW: Many foundries exhibited at the Design Engineering Show, Cobo Hall, Detroit, in addition to three foundry trade associations as reported on p. 26 of FOUNDRY, July issue. Seen above are exhibits of Hamilton Foundry Inc., Hamilton, Ohio (top); Waukesha Foundry Co., Waukesha, Wis. (middle); and Decatur Casting Co., Decatur, Ind. (bottom)

GREATER SAVINGS FOR YOU WITH

No other molding method can match the advantages offered by the foundry-proved Slinger. Not only does the Slinger offer essential quality advantages, but the Slinger method also provides maximum productive capacity per worker, per dollar, per square foot of floor space. The Slinger offers maximum flexibility in foundries where frequent pattern changes and wide differences in flask sizes are necessary during a day's operation. These changes may be made without interruption to production and this results in appreciable man-hour savings.

B&P SANDSLINGERS®

For Production or Jobbing Foundries — Sandslingers Provide Outstanding Ramming Capacity — Greater Flexibility

In addition, a wide range of auxiliary equipment such as Rol-A-Draw and Roto-Mold turntable or loop conveyor can be added at any time to extend the productive capacity of your Slinger installation.

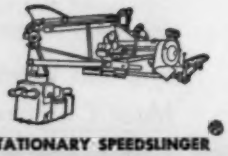
Slingers are not limited as to the mold size that may be rammed. They offer a complete line of Sandslingers, Hydra-Slingers, Speedslingers and Autoslingers that attain ramming capacities of from 700 to over 2000 pounds of sand per minute, assuring productivity not attained by other methods . . . regardless of the basis of comparison.

The Sandslinger's hard uniform ramming assures high mold hardness over the entire pattern face, on vertical as well as horizontal surfaces. Because of the uniformity of Slinger ramming, permeability will be much higher than that accompanying comparable mold hardness attained by other methods. The results are truer-to-pattern castings of more uniform weight and of greatly improved surface quality. Cleaning and finishing costs are markedly reduced, and the elimination of many troublesome defects is favorably reflected in a lowered scrap rate.

A SLINGER FOR EVERY JOB

STATIONARY SANDSLINGER®

HYDRA-SLINGER®



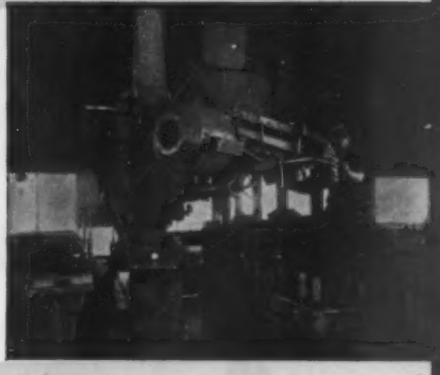
STATIONARY SPEEDSLINGER®

BETTER METHODS FROM B & P RESEARCH

The Slinger is the world's most versatile molding device. No other unit serves as wide a range of application at as low an installation cost. Slingers are very widely used to ram both molds and cores. There is no need to change existing equipment in adapting a foundry operation to the Slinger method. Slingers handle all types of patterns—either wood or metal—and all types of flask equipment.

The flexible Slingers can be used independently or with a wide range of auxiliary equipment such as the Rol-A-Draw and roller conveyor or, as shown here, the Roto-Mold turntable. No matter what your requirements, jobbing, semi-production or production, the Slinger either independently or teamed with other equipment will provide quality and productivity unapproached by any other molding method.

Where, due to the size of flasks or other conditions, it is not feasible to move flasks to a ramming station, the Motive Sandslinger, Motive Hydra-Slinger or Motive Speedslinger is recommended. The great range of operation built into these machines makes them truly applicable to the widest possible variety of jobbing foundry production . . . and these Slingers offer ample ramming capacities for the biggest job.



Beardsley & Piper sales representatives are well equipped through training and experience to aid in your selection of a Slinger. These men consider each foundry and its operating conditions before recommending the model of Sandslinger, Hydra-Slinger, Speedslinger or Autoslinger to be installed. Their experience, reflected in this recommendation, is an assurance of lasting satisfaction, and this experience together with that of the engineering organization behind them, is at your call—no obligation, of course.

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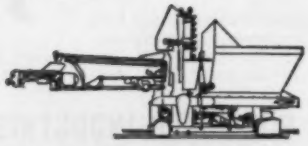
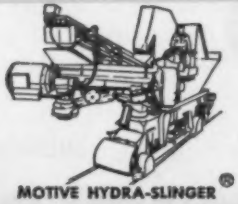


MOTIVE SANDSLINGER®



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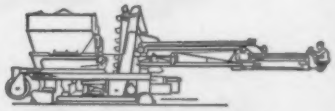

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Calendar of MEETINGS

August 1—Foundry Facing Manufacturers Association, Executive House, Chicago.

Aug. 28-Sept. 1—International Heat Transfer Conference, University of Colorado, Boulder, Colo.

Sept. 11-13—European Investment Casting Congress, Italy.

Sept. 18-20—Non-Ferrous Founders' Society, annual meeting, Shawnee Inn, Shawnee-on-Delaware, Pa.

Sept. 21—Cast Bronze Bearing Institute, annual meeting, Shawnee Inn, Shawnee-on-Delaware, Pa.

Sept. 21-22—Missouri Valley Regional Foundry Conference, Missouri School of Mines and Metallurgy, Rolla, Mo.

Sept. 22-23—East Coast Regional Foundry Conference, Statler-Hilton Hotel, New York.

Sept. 24-26—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 27-28—American Die Casting Institute, annual meeting, Edgewater Beach Hotel, Chicago.

Oct. 5-6—Ohio Regional Foundry Conference, Netherland Plaza Hotel, Cincinnati.

Oct. 5-6—Congress of German Foundrymen's Associations, Dusseldorf, Germany.

Oct. 7-10—Conveyor Equipment Manufacturers Association, annual meeting, Ponte Vedra Inn, Ponte Vedra Beach, Fla.

Oct. 13-14—New England Foundry Conference, Massachusetts Institute of Technology, Cambridge, Mass.

Oct. 16-21—National Industrial Sand Association, semiannual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 18-20—Gray Iron Founders' Society, annual meeting, Royal York Hotel, Toronto, Ont.

Oct. 19-20—Michigan Regional Foundry Conference, Kellogg Center, Michigan State University, East Lansing, Mich.

Oct. 19-21—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 23-25—Abrasive Grain Association, fall meeting, Waldorf-Astoria Hotel, New York.

Oct. 23-27—American Society for Metals, National Metal Congress & Exposition, Cobo Hall, Detroit.

Oct. 26-27—Purdue Metals Casting Conference, Purdue University, Lafayette, Ind.

Nov. 13-15—Steel Founders' Society of America, Technical & Operating Conference, Hotel Pick-Carter, Cleveland.

Nov. 15-17—National Foundry Association, annual meeting, Savoy-Hilton Hotel, New York.

Dec. 6-8—American Institute of Mining, Metallurgical, & Petroleum Engineers, Electric Furnace Conference, Penn-Sheraton Hotel, Pittsburgh.

1962

Jan. 22-23—Industrial Heating Equipment Association, annual winter meeting, Drake Hotel, Chicago.

May 7-11—American Foundrymen's Society, 66th Annual Castings Congress & Exposition (held in conjunction with the 29th International Foundry Congress), Cobo Hall, Detroit.

Sept. 1-9—German Foundry Trade Fair and annual meeting, German Foundrymen's Technical Association, Dusseldorf, Germany.

Sept. 25-28—Society of Diecasting Engineers, 2nd National Diecasting Exposition & Congress, Cobo Hall, Detroit.

A demonstration of WHEELABRATOR'S

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A minimum of three chemical analyses is performed on each heat of Wheelabrator Steel Shot to assure conformity to rigid chemical standards. Detailed laboratory analysis of microstructure further assures product uniformity.

Wheelabrator steel shot® consistent quality controls cleaning costs

To achieve a uniform finish in blast cleaning operations, at a relatively constant and predictable cost, and at uniform production rates, the abrasive used must be of uniform hardness and quality. Wheelabrator Steel Shot gives you this uniformity, from box to box and shipment to shipment. Its hardness, chemical analysis, microstructure and density are carefully maintained by close production controls and detailed laboratory analysis. Wheelabrator Steel Shot gives you the Vital Values of uniform cleaning results, uniformly fast cleaning speeds, reduced maintenance of your blast equipment, and uniformly low cleaning costs. Get the complete story in our Handbook of Blast Cleaning Abrasive Performance.

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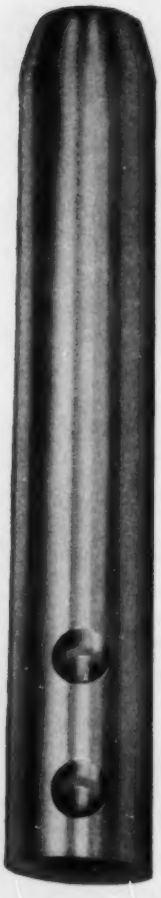

ADAMS 1" ROUND PIN
Side Mounting—Reversible
Countersunk Both Sides
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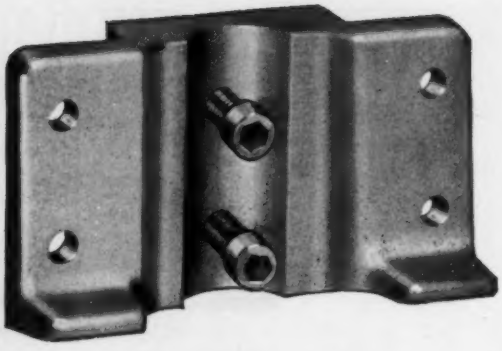

ADAMS 1" ROUND PIN BASE
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For Side Mounted Reversible Pins
Pins Mounted with Allen
Hollow Head Set Screws

ADAMS MATCH PLATE EAR
Extra Long for
1" diameter Pins
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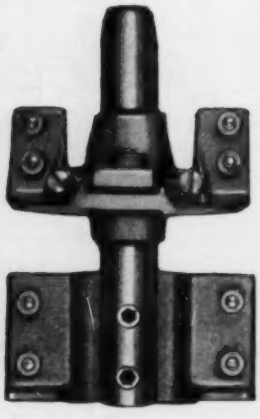

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Side Mounting Permits Use of
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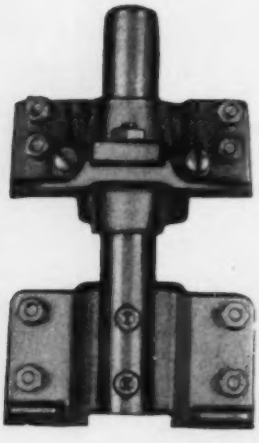

ADAMS 1" ROUND PIN AND EAR
(For Aluminum Flasks)
Side Mounting Assures Rigidity
of Pin. Adds Extra Life Because
of Simple Reversible Feature

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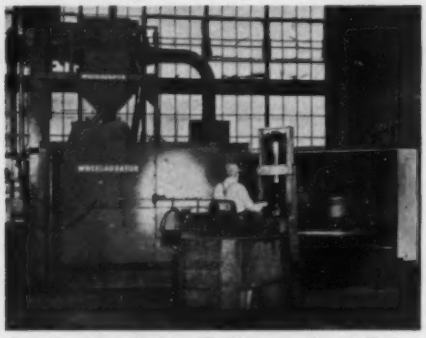
VITAL VALUES



Double-door Swing Table permits full-time cleaning operation. One load is being cleaned in the cabinet, while lift truck positions second load on alternate door.

Wheelabrator swing table **cleans** giant castings in one-sixth former time

Improved quality of cleaning and decreased cleaning time were immediate results of the replacement of an old airblast room with a 96" Wheelabrator Swing Table at a Michigan production plant for removing sand and annealing scale from castings weighing up to 10,000 lbs. each. The tremendous abrasive barrage from the two high-capacity Wheelabrator units combined with the ease of handling provided with the double work tables are reflected in greatly improved cleaning speed. In one case, pieces which formerly required several hours in the airblast room are now Wheelabrator cleaned in just 15 minutes. This capacity for work is just one of the vital values Wheelabrator equipment delivers to cost-conscious users. Write for complete information.

VITAL VALUES FOR INDUSTRY

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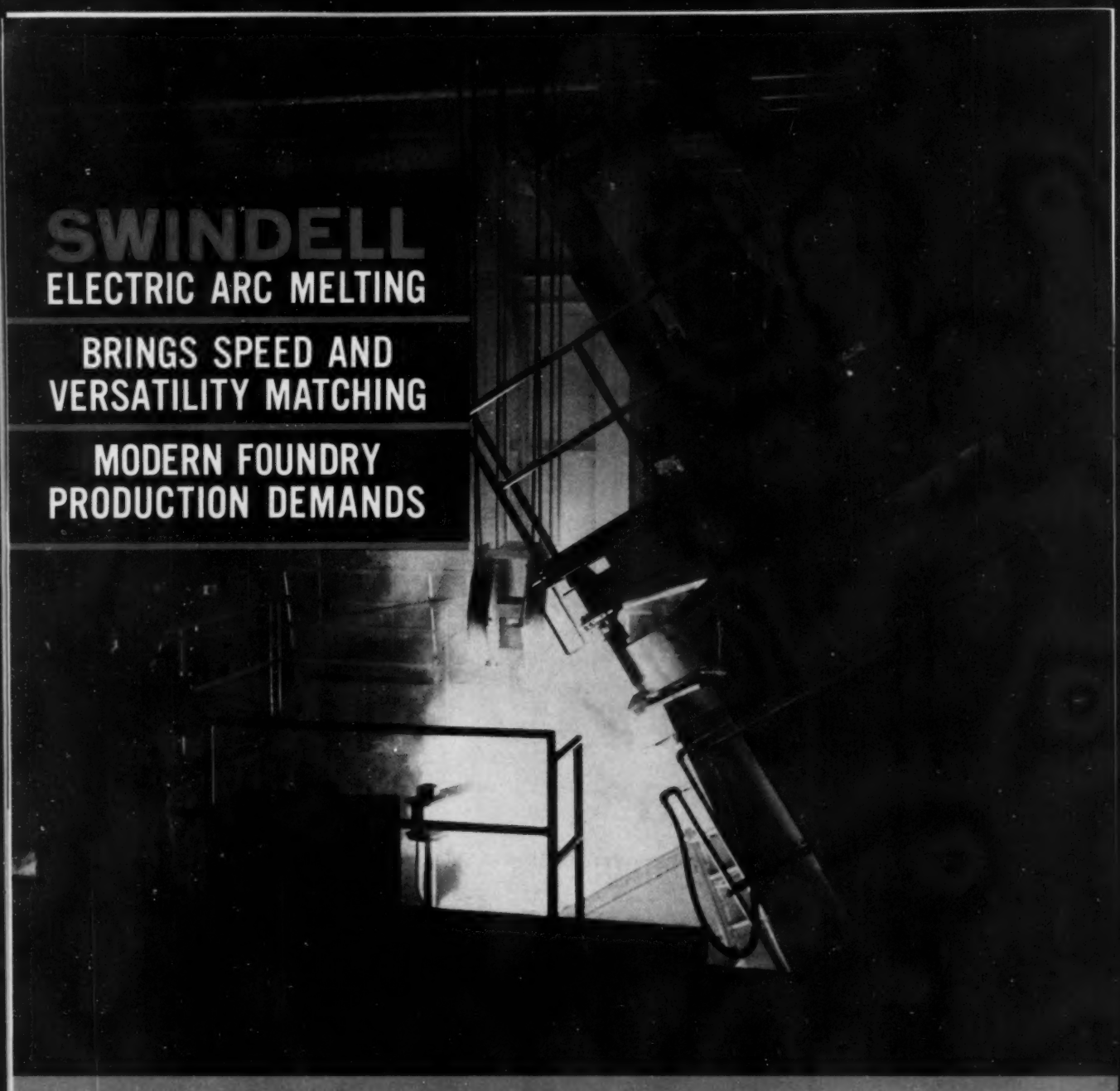

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For More Information Circle 579, Page 87

Let's Quit Bitching!

As might be expected, the recent recession resulted in the mortality of a number of foundries. Both jobbing and captive shops are among those which have discontinued operations and dismantled their capacity.

News of such closings has caused timid souls, both within and without the industry, to view the future prospects of castings producers with considerable alarm. This alarm created the impression that the attrition among foundries has been tremendous. What are the facts?

Every two years FOUNDRY completes a new edition of *Penton's Foundry List*, a census of all plants producing castings in the United States and Canada. The 1961-62 edition has been published, and the numerical results are presented on p. 50. These statistics show the geographical distribution of foundries now and in 1959, thus revealing what actually has taken place in the industry since two years ago.

Since our previous report, 601 plants were removed from the list for various reasons. Of this total 212 went out of business, 199 discontinued casting operations, 120 could not be located, 40 were merged with other plants, 12 were reported as inactive, and 18 now are making components other than castings.

To offset them, 395 plants were added to the list. These were new, or information on them was not available previously.

Therefore, the net loss in plants for the two-year period was 206 plants. This total, which is lower than normal, hardly justifies the grave concern over the welfare of the industry which has been expressed in some quarters. Essentially, it reflects the long-term trend to fewer but larger and more efficient foundries—a trend in all industry today.

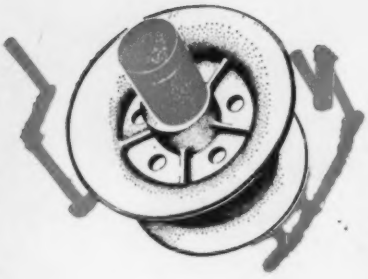
Firsthand information indicates that plants discontinued operations for these reasons: Many did not keep up with technical progress or lacked modern equipment to do the job. Some captive shops were too far away from the board of directors and therefore were neglected. A number of companies gave a piece of the plant away with each order through unintelligent pricing. Frequently management simply did not understand the problems of operating a business in the sixties.

The small net loss in plants since 1959 proves that the foundry industry is rugged in the face of economic adversity. With alert management, willing to apply today's knowhow and modern equipment to the production of castings which will be sold by well trained and intelligent salesmen at prices that provide a fair return on the operation, foundries can move ahead toward a much greater potential.

Let's stop bitching and show pride in an industry that has withstood the storm so well!

Frank G. Steinebach

Publisher
Editorial Director



GATING

Permanent Mold Aluminum

The first of two articles on this process includes descriptions of types of permanent mold gating systems and a discussion of proper gating design

● GATING and risering of aluminum alloy castings in permanent molds is predicated on the same principles of fluid flow, solidification behavior, and heat transfer that apply to other metals and other types of molds. Since aluminum is a metal that drosses readily, the gating must be controlled to minimize turbulence, air aspiration, and metal damage.

The commercial aluminum alloys, except for the eutectic aluminum-silicon compositions, have a large liquidus-solidus temperature spread. When this factor is considered along with the influence of the high thermal conductivity, the necessity for high thermal gradients during solidification to insure soundness becomes apparent.

The mechanical properties of aluminum castings have been shown to be strongly dependent on attaining these high thermal gradients and a rapid solidification rate. The high heat conductivity and high heat capacity of permanent metal molds, however, increase the solidification rate of aluminum castings made in a permanent mold and, therefore, assist in attaining good mechanical properties.

A permanent mold places definite restrictions on the complexity of the shapes that can be cast and on the design of the gating and risering system. Systems of even moderate complexity require multipiece molds and cores and increase mold and operating costs considerably. For these reasons molds having a single parting line are preferred, and the location of the gates and risers is restricted by parting line considerations.

Terminology of the gates and risers follows the general practice for foundry operations. Metal is poured into a small, funnel-shaped pouring basin at the top of the sprue. The vertical sprue frequently terminates in a sprue well. The runner is a web that is thinner than the sprue and connects the sprue to a side riser or to the mold cavity.

The connection from the gating or risering system to the mold cavity is termed the ingate. Accordingly, when side risers are employed, the ingate also serves as a riser neck. Two types of risers are employed. The usual type is a side riser oriented vertically alongside the mold cavity and extending somewhat higher in the mold than the top of the casting. Top risers or overflows are employed on the central, upper portions of the castings. Top risers may be connected to the gating system or filled only from the mold cavity.

Types of Gating Systems—A brief review of some of the gating and risering systems employed for permanent-mold aluminum castings serves to indicate some of the procedures and restrictions in this type of casting. The frame or ring gating shown in Fig. 1 is used for square, rectangular, and round castings of all sizes and may be poured two-up through two separate pouring basins.

This type of gating is employed widely in slide and book molds for l

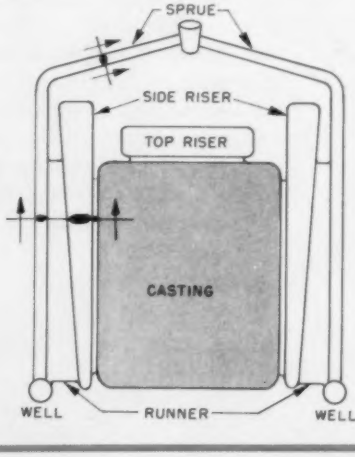


Fig. 1—The frame or ring gating depicted here is used for square, rectangular, and round castings of all sizes

Alloy Castings

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to 50-lb domestic and industrial castings. Heavy sprues lead into a small well, through runners into a heavy side riser. The top riser is filled either through the cavity or through cavity and ties between the side and top risers (not shown in sketch).

The upper edges of the runners are approximately at the same height as the upper edge of the cavity. This type of gating may result in shrinkage in the upper portion of the casting, trapped air at the top or under cores, and misruns. The bottom portion of the casting frequently shows the result of some metal damage from gating turbulence.

When the mold sections are hinged from a stationary mold back, a center gating system as illustrated in Fig. 2 is employed. This design for round or rectangular castings has the advantage of good feeding to heavy central sections. Difficulty occurs with porosity opposite the ingate and air entrapment in the upper part of the casting.

Gooseneck gating, Fig. 3, provides for bottom pouring and good venting. The bottom of the sprue is choked so that the molder can keep the sprue full to prevent air aspiration in the sprue. Difficulties are encountered with shrinkage opposite the ingate at the bottom of the casting and with failure to fill completely at top and opposite side of the ingate. A shortcoming is the large temperature difference in the mold, which is very hot at the bottom at the ingate side and cold at the top opposite the ingate. The top riser is filled with the first poured metal. After it has risen through the entire height of the cavity it has lost considerable heat. Under these conditions, the top riser acts only as an overflow for cold metal and is limited in its feeding ability.

The double cavity gating sketched in Fig. 4 is employed for small castings. The runner in this arrangement is horizontal as compared to the vertical type used in Fig. 1 and 2. The casting must be small and filled rapidly to avoid unfavorable thermal gradients and shrinkage under the top riser. The casting appearance shows strong turbulence within the cavity ("curly maple" flow lines).

Shortcomings of the system are: Air is cut off from escaping to the top riser by metal rushing into the cavity and up into the riser before the entire cavity is filled, particularly if the direct flow to the opposite side of the ingate is prevented by a center core. Air aspired into the sprue is frozen in the casting before it can rise into the top riser. The top riser does not feed well because it is filled through the cavity; the last metal poured, hence the hottest, is in the cavity rather than in the riser.

Gating Design—The gating system design determines whether a casting can be poured without metal damage from turbulence. An improperly designed gating system will lead to a poor surface, dross inclusions, and aspirated air.

In addition, the gating system influences thermal gradients in the mold cavity and is important in de-

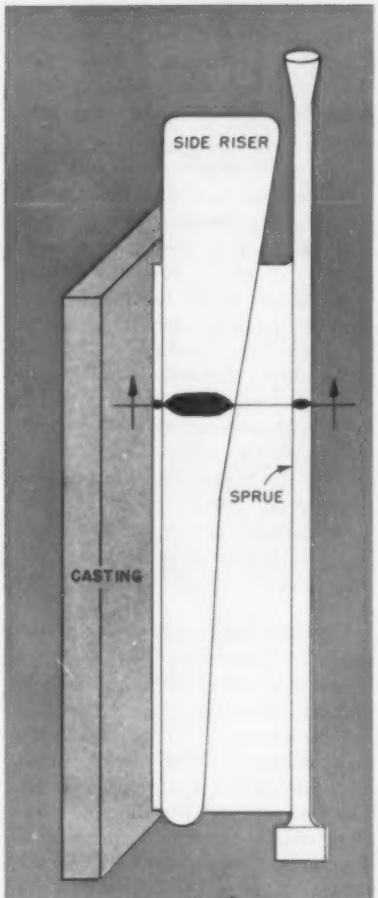
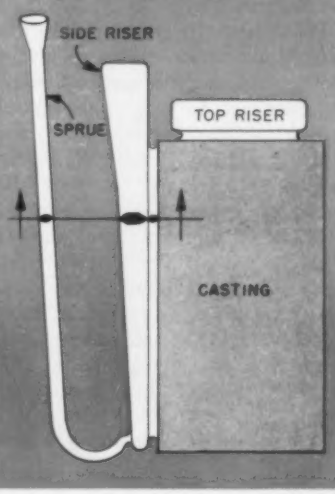


Fig. 2—Center gating is used to feed the heavy central sections of round or rectangular castings

Fig. 3 — Gooseneck gating provides for bottom pouring and good venting but top riser does not feed the casting



termining the feeding ability of the risers. The latter fact is very significant in permanent molds because the high heat capacity and thermal conductivity of the mold material result in a rapid heat loss of the metal to the mold.

Turbulence is a fluid flow problem. It is a function of the cross-sectional area of the flow passage, the flow velocity, and the density and viscosity of the medium. Conditions governing flow characteristics have been studied extensively for common liquids. For molten metals poured into permanent molds the conditions can be grouped according to the shape of the gating system, the speed of the metal flow (dependent primarily on the vertical distance from the pouring basin) and according to inherent fluid properties such as viscosity and density.

Viscosity and density vary too small an amount within the range of pouring temperatures to be significant; therefore, turbulence will not be caused by metal being too fluid if conditions allowing turbulent flow are not already present. The velocity of the liquid metal along the sprue and in the rest of the gating system depends on the vertical distance from the top of the mold and on the losses in energy from changes in direction and losses due to viscosity.

The velocity attainable within a given height can be reduced to some extent by the shape of the sprue. Therefore, all factors determining flow characteristics that are not inherent metal properties lie within the shape of the gating system and can be taken under consideration by the designer.

The Sprue—A pouring basin is situated at the top of the sprue. Its size depends on the speed of pouring necessary to keep the enclosed portion of the sprue filled. For pouring castings rapidly, sufficient volume is necessary so that the pourer can keep the basin partially filled at all times without danger of overflowing. The natural tendency of any molder is to slow down the pour if the basin lacks the capacity to accommodate small surges from the pouring ladle. This frequently results in an inadequate rate.

The use of large pouring basins on top of molds to be filled rapidly to a certain level, eliminates operator fatigue from slow pouring; furthermore, it is possible to fill the pouring basins automatically with a metal pump or by tapping a holding furnace intermittently, if the flow is controlled within the mold.

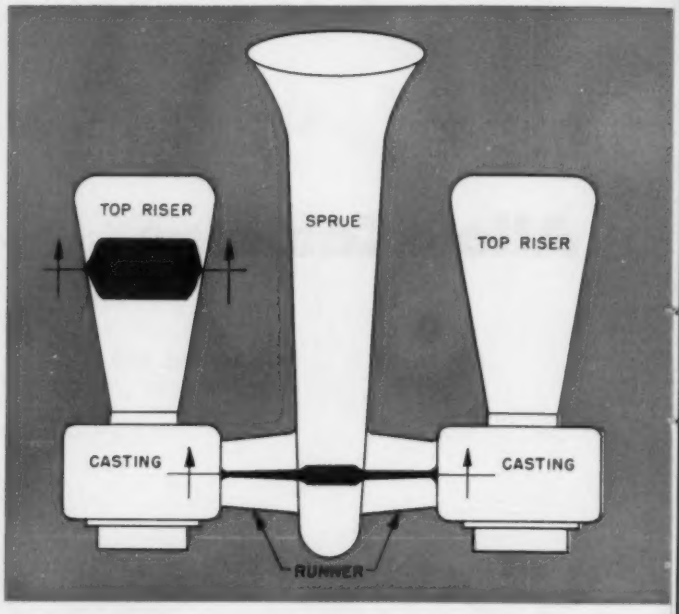


Fig. 4—Double cavity gating for small castings. Mold must be filled rapidly to prevent unfavorable thermal gradients and shrinkage under top risers

From the pouring basin to the point where the sprue joins the runner the flow passage is fully enclosed, resembling a flattened pipe. From there on, flow takes place in an open system resembling a channel. The point where the stream of metal is discharged from the enclosed system into the open one is called a nozzle. The shape of the sprue leading to the nozzle as well as the shape of the nozzle itself are very important.

If the flow of an incompressible fluid is continuous and steady, equal weights of the medium pass through any cross-sectional area of the flow passage in equal time intervals. In mathematical terms:

$$\rho \times A \times V = \text{constant} \qquad (1)$$

where: ρ = density of the fluid
A = cross-sectional area at any point of the flow passage
V = velocity of fluid at point of observation

Equation (1) is called Equation of Continuity. The velocity of the molten metal increases as the metal flows down the sprue. As the flow velocity increases, the cross section of the stream decreases. If the enclosing sprue sides do not converge according to the decreasing cross section of the stream, the stream tends to break up. This means that to reduce turbulence, the cross-sectional area at the point of discharge (or nozzle) into the open system must correspond to the increased velocity and smaller cross section of the stream.

Theoretically, the cross-sectional area of the sprue should decrease as a parabolic function dependent on the vertical distance from the pouring basin. In practice, the same result may be obtained in a simpler fashion by restricting the nozzle or choking the sprue.

If the pouring rate is controlled within the mold at the nozzle, much of the problem of skill and cooperation of the molder is removed from the scope of daily production worries. To determine during the design stage the sprue size required one can easily picture a small casting poured from a small ladle in a thin, little stream, or a large one from a large, supported ladle in a thick stream. Generally the foundryman has a good idea of the rate of pour to be expected for a certain size and complexity of a casting and can design the gating system

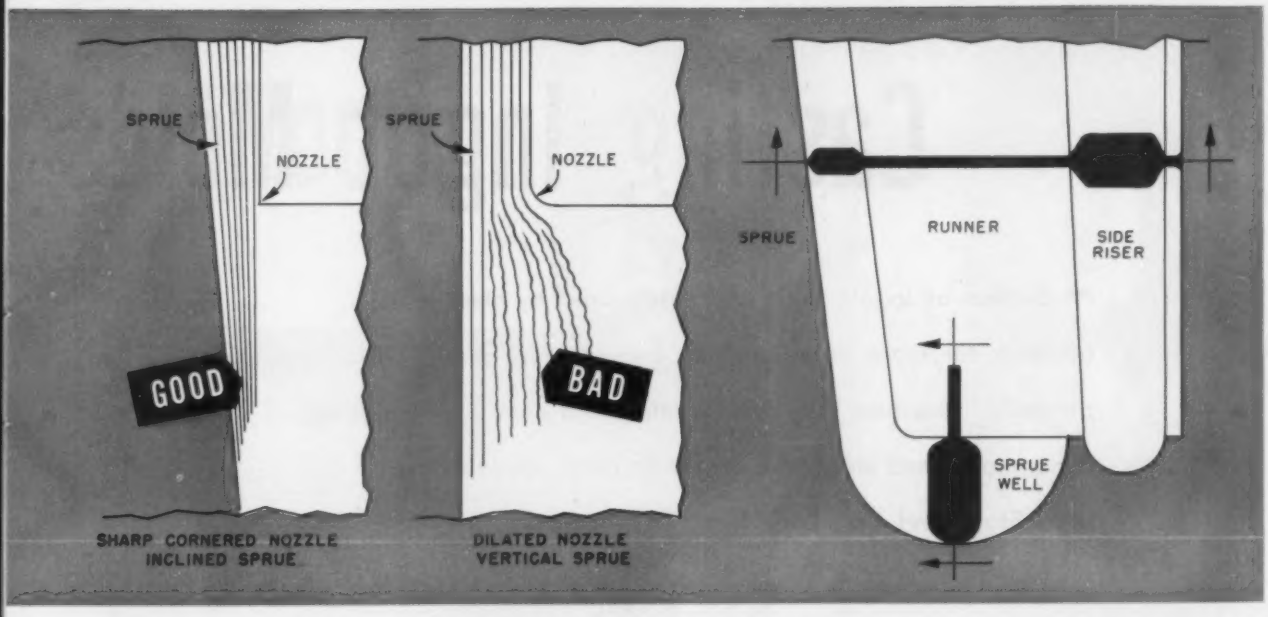


Fig. 5—Any radius or chamfer in the nozzle area of the sprue may cause turbulence. The sprue wall must end abruptly with a sharp angle

Fig. 6—Recommended type of sprue well allows the metal to flow without an abrupt change in direction which would create unwanted turbulence

accordingly. Table I gives the relationship between the diameter of the stream of metal a short distance from the lip of the ladle, its cross-sectional area, and the rate of pour in pounds per second for aluminum.

TABLE I—Aluminum Pouring Rate

Diameter of Pouring Stream, in.	Cross Section of Stream, sq in.	Rate of Pour, Lb per Sec.
¼	.049	.9
⅜	.110	2.1
½	.196	3.7
⅝	.307	5.9
¾	.442	8.5

Nozzle Shape—The nozzle as defined above is not a true nozzle in the general concept, because the sprue continues to envelop the stream of metal 180 or more degrees. The discontinued portion of the sprue wall must end abruptly with a sharp angle. Any dilation of the sprue at this point in the form of a radius or chamfer may cause turbulence, because the metal tends to flow along and cling to the walls of the flow passages, as illustrated in Fig. 5. Here is one exception to the foundryman's rule that the more radiuses and fillets a mold has, the less likely it is to give trouble.

Metal issuing from the nozzle into the open system flowing without side restrictions increases its velocity on the descent. If the velocity reaches a certain maximum, the sheath of oxide film (and/or the surface tension of the metal) will not be strong enough to keep the metal in a continuous, steady stream; the stream will break into droplets. Breaking of a stream in a mold results in oxide formation and dispersion of air when the discontinuous flow combines at the bottom of the sprue with splashing.

To prevent breaking the steady flow issuing from the nozzle, the sprue should be inclined. Thus, the drop in height is reduced for a given sprue length, and the flow velocity is decreased considerably. Furthermore, the stream is supported firmly by the channel of the sprue, so that the break-up into individual droplets of metal is less likely to occur than it would be in a vertical sprue.

In practice, a sprue incline of 3 to 10 degrees often is sufficient. The higher the mold, the larger the angle. The bottom of the sprue preferably ends in a well of the type shown in Fig. 6 into which the metal should flow without abrupt changes in direction.

The Runner—The runner leads metal from the sprue to the side riser. It should be appreciably thinner than the sprue and side riser to solidify rapidly and prevent the riser from feeding the sprue. A minimum thickness of ⅛ in. is recommended. The runner should extend from the upper edge of the sprue well to a height above the upper mold cavity, so that all air to be displaced from the gating system can escape through the vents on top of the side riser. Otherwise, some air may be washed by the metal flow into the cavity from which it will leave through vents or possibly be trapped. Bringing the runner up high also causes the last hot metal poured to flow into the side riser, thereby aiding in the establishment of desirable thermal gradients.

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Casting Ingot Molds

Production of ingot molds and stools used by steel mills accounts for more than 2 million tons of gray iron annually. Because they are an important item in steelmaking costs, molds and stools are cast with care. Here's how Lone Star Steel Co., Lone Star, Tex., does it

By R. C. HARRELL
Superintendent of Foundries
Lone Star Steel Co.,
Lone Star, Tex.

● GRAY IRON CASTINGS of a special type are vital to the steel industry. These castings are the molds for making ingots which are rolled into various steel products. An example of the specialized foundries which produce these ingot molds is the one at Lone Star Steel Co., Lone Star, Tex.

This foundry is designed to produce efficiently the various molds needed by Lone Star Steel in the production of oil field goods. Ingot molds made here range in weight from 10½ to 17 tons and consist of bottle top, open end, and closed end (big end up) types with either plain or corrugated sides.

The foundry building is 60 to 260 ft and actually is an extension of the pig machine section. It has a rail track running lengthwise for easy handling of hot metal directly from the blast furnace. This track also provides an exit for the finished molds and stools. Other moving equipment includes a 50-ton overhead crane and a 10-ton auxiliary hoist.

Mold and Pattern Equipment—Savings have been made by designing molding equipment components so that they can be assembled in many combinations of flasks, core barrels, mold bases, and coreboxes. The core arbors or core barrels and mold bases are separable to simplify handling and storage. All flasks are cast or fabricated steel and are designed so that flask width can be changed by bolting and pinning prefabricated sections between the parent flask sections. Also, prefabricated sections can be bolted on to change the height of the mold. The mold base is cast iron or fabricated steel.

All core barrels or arbors consist of steel plates welded around one or more heavy steel tubes. They are designed to provide sufficient sand around the barrel section for good molding practice and to prevent warpage of the side plates. These side plates have several small vents in them for quick removal of gas created during casting. Tops of the core barrels have sufficiently large holes for gases to escape. Bottoms of the barrels are open and have heavy bars welded in place for handling. These open bottoms also allow gases to escape.

Patterns for the outside of the ingot molds are made of cast steel for the more common used sizes, but wood with steel posts in each side for lifting is used for less important sizes. Lug patterns are inserted in slide grooves on the upper section of the patterns and can be removed when the flasks are lifted off. Height of the lugs can be changed by inserting locating plates in the slide sections of the mold patterns.

Coreboxes are the most important components of the equipment and are made of cast iron, cast steel, or fabricated steel. They are heavily ribbed to withstand hard use. Their sizes also can be changed by bolting inserts between parent corebox sections. Height can be changed by adding sections with the proper taper.

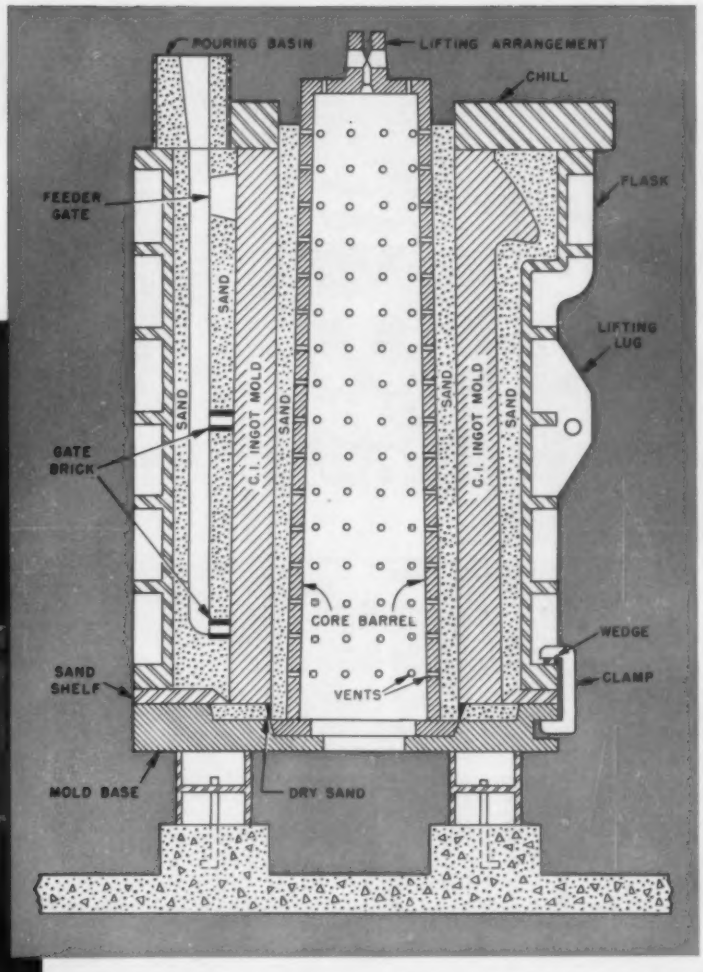
Sand and Its Preparation—Pure, washed (but not dried) silica sand is obtained from the southeastern section of Texas. Its irregular grain structure permits the sand to expand and contract freely during casting and cooling. This property helps to prevent buckling, cracking, distorting, and washing during casting. Grain size distribution is as follows:

Screen No.	Per Cent
12	99
20	94
40	52
60	9
80	2
100	1
150	0.50

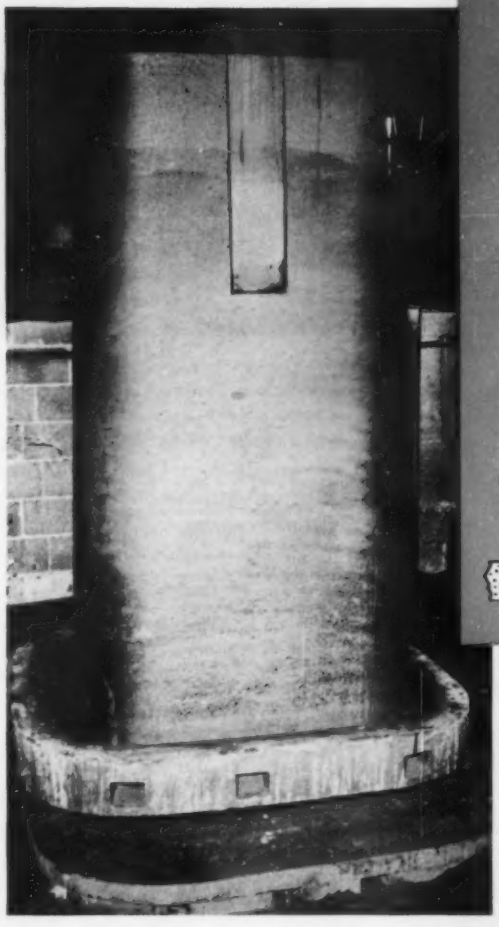
This sand, with its open-grained structure, can be rammed as hard as required and still have sufficient permeability.

Gondola cars bring the sand into the building where it is unloaded by

and Stools



Schematic drawing shows cross section of a mold for pouring an ingot mold. Components include vented core barrel, sand core, sand mold, flask, and chill



This is a typical ingot mold pattern resting on its ramming base. Various lug patterns can be fitted into the slides on the sides of each ingot mold pattern

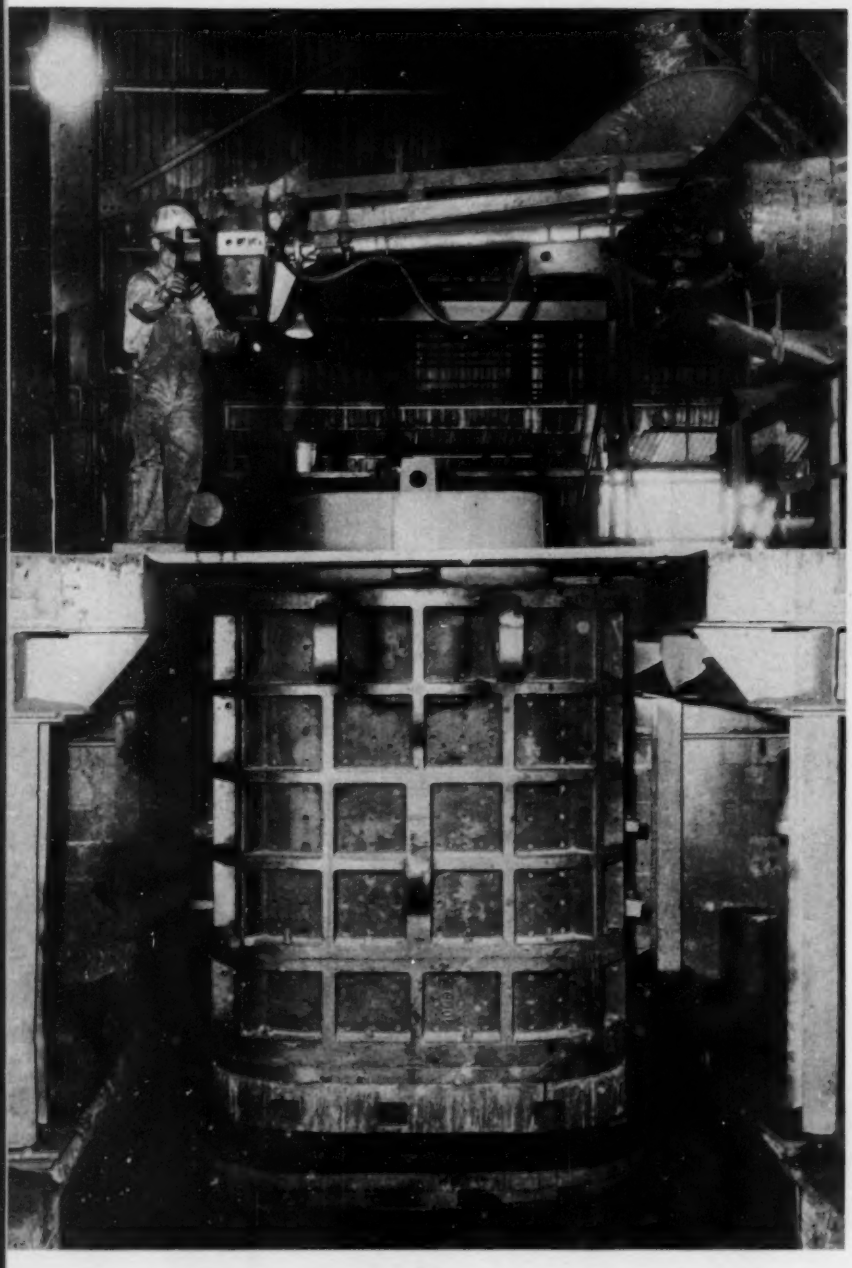
a clamshell bucket into a concrete storage bin at floor level. As needed, the sand is elevated into one of two compartments in a bin over the sand muller.

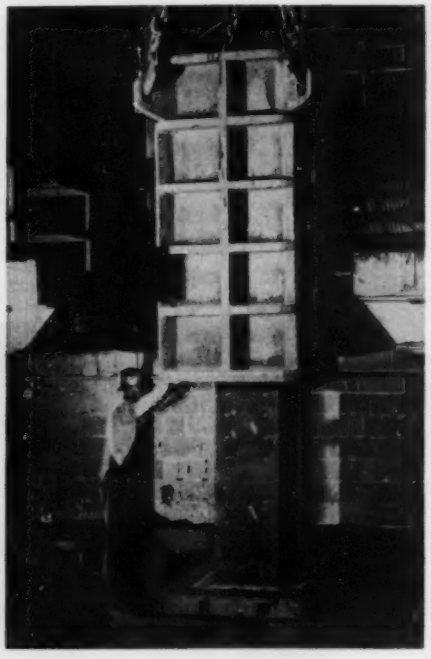
Used sand is elevated from the shakeout pit to a large steel bin directly over a sand reclamation and preparation system. When this sand is released from the bottom of the bin, it goes through a crusher which breaks down the lumps, then it passes over a magnetic pulley which removes tramp iron, and finally it is screened. The prepared sand falls into a skip-hoist bucket to be elevated to the other compartments in the bin over the sand muller.

The sand system has a sand muller just large enough to provide sand for the molds for an ingot mold and stool during the molding cycle. Use of small batches insures freshly tempered sand when it is needed. New and used sands are released from the storage bin into a measuring hopper and then into the muller. Bentonite, pitch binder, and metered water are added during the mulling cycle. Typical batches contain 400 lb used sand, 40 lb new sand, 16 lb bentonite, and 4 lb pitch binder.

The ingredients are mulled 5 to 6 minutes and discharged onto a cleated belt to be elevated to the plate feeder storage bin. The mulled sand has a green strength of 10.5 to 12.5 psi with a permeability of approximately 200 and moisture of 6 to 7 per cent.

Sand Ramming — A stationary sandslinger, situated on a concrete platform 10½ ft above floor level,





Corebox is lowered over the core barrel. Vents in every barrel carry away gases during pouring

Slinger operator rams the sand mold. Gate bricks are placed in the mold during ramming

provides flexibility in making the different mold components of the ingot molds and stools. The slinger platform is rectangular with an opening in the front side to accommodate the largest ingot mold flask.

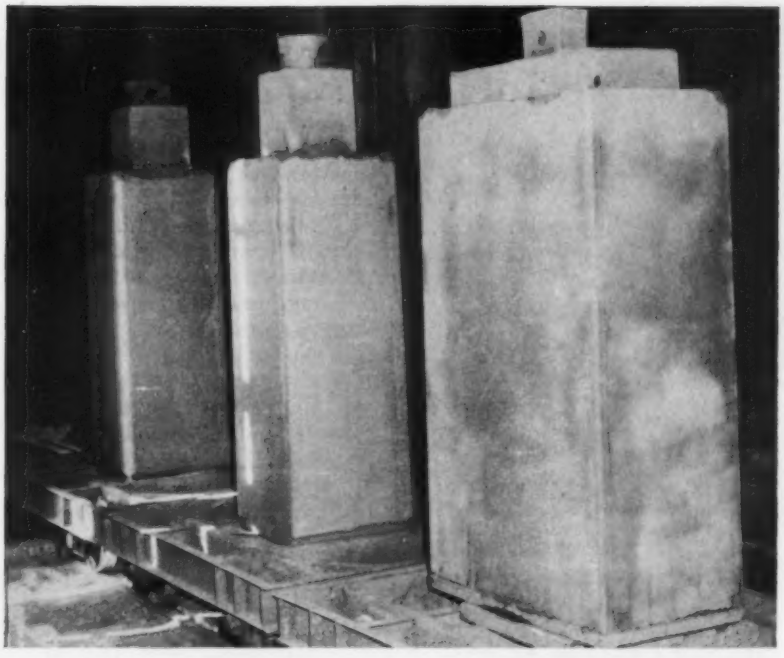
An ingot mold pattern first is set on a ramming base. Then an assembled flask is lowered over the pattern and located by dowel pins in the ramming base.

A platform is placed around the flask to give the slinger operator access to the entire flask area. The operator packs sand around the pattern to a depth of approximately 8 in. Then an air rammer is used to tamp an area where the pouring sprue will be located. Next, the sprue pattern, a 3½-in. OD steel pipe, is placed in this area and secured vertically at the top of the flask. A jig is used to place the first of two 2½ x 9-in. gate bricks with 1½ x 5-in. opening at the bottom of the sprue. The gate brick, in an upright position, forms an opening 1½ x 5 in. along the length of the sprue.

The slinging operation is continued until the flask is half filled, when the second gate brick is inserted. Then the flask is filled to a point where the lug patterns are inserted into the slides and more sand is rammed into the flask until about 8 in. of the flask remains unfilled. A round feeder gate pattern 8 in. on one end and 6 in. on the other is joined to the sprue. Later this feeder pattern is extracted from the inside of the sand mold.

The slinger operator finishes filling the flask and strikes off the excess sand, leaving a smooth surface. When in use, a level, smooth top on the ingot mold aids in cleaning the top after teeming steel, and makes it easier to walk the tops for inspection and applications of protective coating.

Pattern Removal — When the molding operation is completed, the 50-ton crane lowers a four-point spreader bar with chains and hooks which are engaged to four ears on the sand-filled flask for lifting it



These cores are ready for the drying ovens. Cores and molds are dried for 4½ hours before they are assembled

from the pattern. Stripping of the flask from the pattern is difficult sometimes, so a hydraulic jack of 100-ton capacity is placed on top of the pattern post and against the spreader bar. The crane lifts the flask an inch or two until the jack can force the flask free from the pattern without binding, leaving a firm, well-rammed mold. When the lug patterns are clear of the pattern, they are rapped and extracted by hand.

It is very important that this section, which forms the outside wall of the ingot mold, be smooth and free from bulges and swells since these defects would alter the cooling of the steel ingot. When the lift is completed, the sand-filled flask is moved to the blacking stand, loose sand is removed, and the sand mold stamped with the number and size. The number is used as a permanent record for the mold.

The blacking operation is important in the production of quality molds and stools. The blacking, a carbonaceous material, is sprayed on the sand surface under high pressure, driving the material into the pores of the sand.

Coremaking — The assembly for making the core is similar to that for the outside mold. A core barrel or arbor is placed on a corebox ramming base, and the corebox is lowered over the core barrel and located by dowel pins in the base.

Quality and life of the ingot mold depends considerably on the core. With proper sand control and sufficient ramming, the core will be free from swellings, bulges, and slight corrugations. The truer the surfaces of the side walls in the ingot mold, the fewer restrictions will be encountered during stripping of steel ingots.

An air rammer tamps the sand around the core. The sand is spilled slowly from the slinger into the corebox around the core barrel, and the operator rams the sand very carefully and very hard. After the corebox is removed from the core, the latter is sprayed thoroughly with blacking.

The next component to be rammed is the mold base, which forms the bottom of the ingot mold. A false print is placed in the opening where the core barrel seats itself, the recessed section is rammed with the sandslinger and struck off cleanly, and the blacking procedure is repeated.

Stool Making—The wooden stool pattern is mounted permanently on a steel plate, and the flask is made of cast steel. The stools vary in size but the average weight is about 12 tons; each will accommodate one or two ingot molds, with two stools on the mold car.

The assembled flask and pattern are hoisted by crane to the ramming platform where there is about a 2-ft clearance with the slinger head. A refractory gate brick for pouring is placed at one end of the pattern before ramming, and it becomes part of the stool mold. When the flask is filled, the stool mold is lowered to the floor, the top face of the sand mold is struck off evenly, and a ribbed bottom plate with many holes for vents is placed on the flask and bolted securely.

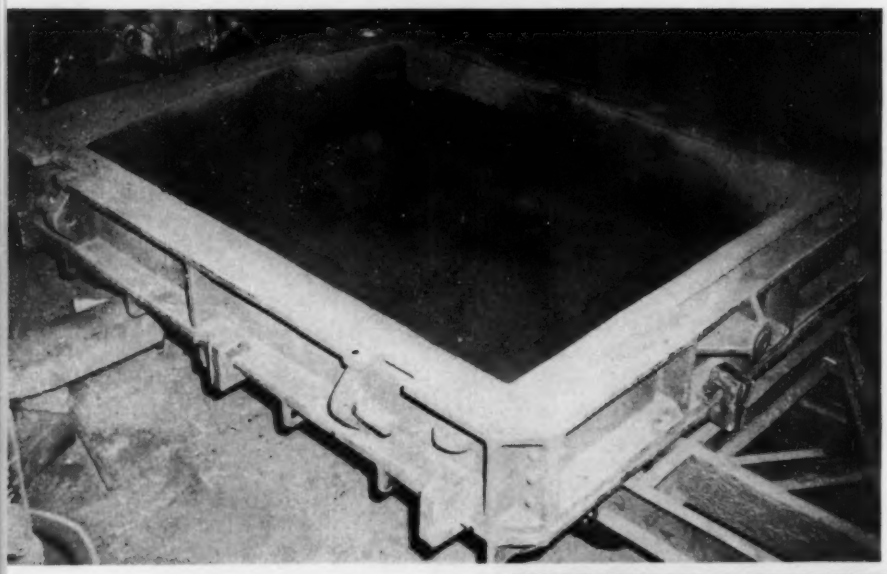
The flask is turned over with the crane, and the pattern plate is drawn out of the stool mold and sprayed. The stool mold also is stamped with a permanent number that will be cast on its side. As is the case with the ingot mold and the cores, it is essential that the stool be rammed very firmly.

Finished sand molds and cores are picked up by the crane and placed on cars which carry them into the recirculating down-draft ovens where they are dried for 4½ hours at 450° F. After drying, the parts are ready for assembly. Drying of the sand molds must be thorough since a damp sand mold of this size could cause iron turbulence and possibly a steam blow.

Preparation for Pouring — After drying, the mold components and stools are taken to the pouring station by crane. The mold base is placed on the pouring platform first and made level. The core is placed in a seating area in the mold base, and the small opening between the bottom of the core and the mold base is chinked with sand, which is smoothed over and brushed with blacking to prevent formation of fins.

Next a sealing material is placed on the print of the mold base and the mold is lowered over the core. Dowel pins in the mold base and bushings in the flask serve to locate the mold properly. Finally the mold and mold base are clamped together and locked by a safety frame.

A pouring basin, consisting of a sand-lined steel pipe 14-in. in diam by 18 in. high, is placed over the sprue hole of the mold and the joint



Stool mold, shown here, is made similarly to the other molds. A wood pattern mounted on a steel plate normally is used

This mold is being poured for a bottle top ingot mold. Open end and closed end ingot molds also are produced in the foundry

Chills have been positioned on a stool mold which is ready for pouring. Edges of the chills are mudded to prevent runouts

is smoothed over to prevent washing.

The last step of the assembly is peculiar to this foundry. A two-piece iron chill approximately 10-in. thick is placed on top of the mold and around the core to make a top for the mold. A small space is left between the core and the chill. This is done to prevent the chill from crushing the core when it is being placed on the mold.

Preparation of the stool mold for pouring is similar to that of the ingot mold. It is placed on rails at a separate pouring station, leveled, and a pouring basin is placed over the sprue hole. Then, a two-piece chill similar to that used on the molds is placed on the stool flask, making a complete cover for the cavity to be poured. The chills are mudded around the outer edges to prevent iron from running out between the stool flask and the chill.

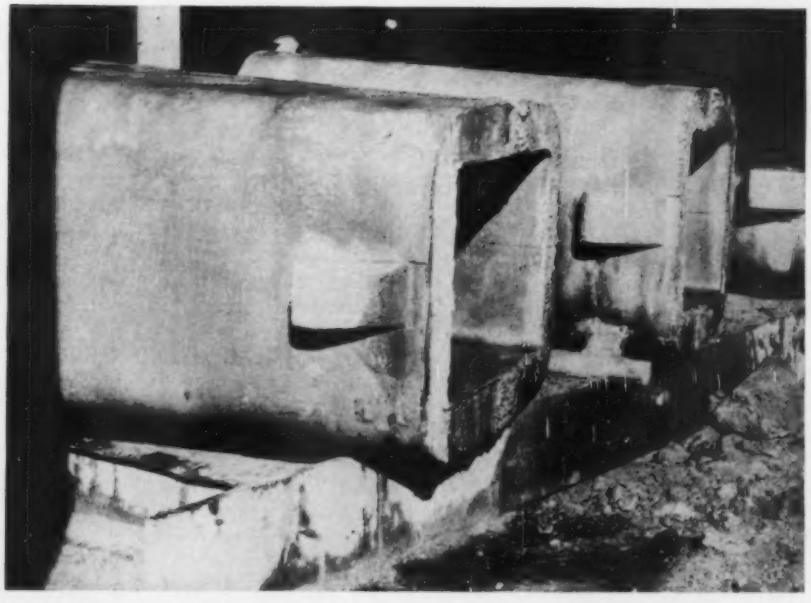
Pouring Operation—Hot metal is brought from the blast furnace in open-top ladles of 75 to 90 tons capacity and transferred to a 30-ton bottom-pour via a basin which traps kish and slag. During transfer, the metal temperature drops to about 2400° F, the desired temperature.

Approximately three minutes is required to pour 12 tons of metal. As the iron is poured, gas torches under the mold and on top ignite

escaping gases. When the iron rises and rests against the chill, pouring is discontinued for a few minutes.

Immediately, water is sprayed on and around the chill to solidify the molten metal at the top of the mold. When the iron has solidified, the pourer feeds iron slowly into the pouring basin to compensate for shrinkage. Feeding continues until the basin metal begins to freeze. Wetting the metal with water freezes the top of the casting and feeding actually is done under pressure at this point. The feeding insures sound lifting lugs with a minimum of shrinkage in the top area.

The stool is poured similarly, but no feeding is necessary since the chill on top of the sand mold is large enough to prevent shrinkage.



Molds and stools are placed by crane on chipping rails where core sand remaining after shakeout is removed with long chisel bars

Shakeout — After pouring, the molds and stools are not disturbed until completely solidified. Cooling requires about ½ hour per ton of casting. During this period the castings remain at the pouring station or they are moved intact to the shakeout pit. When a casting has solidified, the clamps are removed from the mold base and flask jacket and one-half of the flask is removed. Then the mold is rolled over and the remaining half of the flask is removed.

The core barrel is loosened by bumping it in the shakeout rack and then it is extracted. In the case of closed bottom or bottle top molds, a small amount of water treated with a wetting agent is sprayed around the core barrel so that the sand softens immediately and the core barrel is extracted with ease. The same procedure is used for shaking out the stools.

Chipping and Cleaning — Molds and stools cool in the shakeout pit for approximately 24 hours. Then they are placed by the crane on the chipping rails where the remaining core sand is removed by a long chisel bar. Gates are broken off cleanly when given a blow by a drop ball attached to the magnet on the crane. No chipping is necessary at the gate section. Sand around the mold peels off during the cooling period and subsequent handling.

Little chipping or grinding is necessary on the inside of the mold. Some of the blacking from the core adheres to the ingot mold, giving it a good protective coating. In some instances, if the coating is not sufficient, additional blacking is brushed on. The molds and stools are placed on a special flat rail car after cleaning and sent to the open hearth.

Chemistry of Hot Metal — The problem of suppling suitable pig iron for production of cast iron pressure pipe and hot metal for open-hearth furnaces from only one blast furnace makes it almost impossible to secure a rigid control of the blast furnace metal used in casting ingot molds and stools. Therefore, many molds and stools are cast with metal that commonly would not be used. However, the life of molds and stools is about the same whether or not they are made of optimum iron.

Hot metal direct from the blast furnace is classed as a medium-phosphorus iron, averaging about 0.25 per cent P, which is conducive to making good ingot molds and stools. Higher percentages of phosphorus cause the iron to become weak, brittle, and subject to cracking in sudden changes of temperature, such as occurs when molten steel is poured into a cold ingot mold.

Manganese content of the iron is around 0.40 per cent; however, at times lower manganese irons are used. Silicon ranges from 0.60 to 2.00 per cent and even the higher limit does not seem to lessen mold life materially. Sulfur is 0.025 to 0.085 per cent. Carbon varies from 4.25 to 4.80 per cent. Opinions are that the high carbon iron is an advantage in casting ingot molds and stools and offsets some of the irregularities in the elements of this iron.

Due to the thick sections of the ingot molds and stools, the thick sand mold, and the slow cooling of the metal below the freezing temperature, a high proportion of the carbon is in the graphite state. These factors also promote the formation of large size graphite, a condition believed to contribute to long mold life through resistance to warpage.

The ratio of 34.40 lb of ingot molds and 19.85 lb of stools to each ton of steel ingot produced has been a prime factor in low-cost steelmaking. Chipping and cleaning cost has reached a low of 1/10 man-hour per ton of ingot mold and stool cast. Also, a rejection rate of less than ¼ of 1 per cent of ingot molds and stools cast over a period of eight years speaks well of the foundry practice employed.

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A Metallurgical Look at

300-YEAR-OLD IRON

Analysis of cast iron pipe installed in 1664 raises two questions:
Why is the manganese content so low?
Does a highly phosphoric cast iron have superior corrosion resistance?

By WARREN C. JEFFERY
Product Development Manager
McWane Cast Iron Pipe Co.
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● DURING the period 1650-1700, a major contribution of the foundry industry was the casting of large-diameter cast iron pressure pipe. The use of cast iron pipe for water systems undoubtedly saved many lives since it protected the water supply from contamination.

In 1664, cast iron pipe was installed to bring water to the palace of Versailles. This system, still in use, consists of sections of flanged cast iron pipe bolted together. A section of the pipe, about 12.5 in. ID, is shown in Fig. 1.

The casting of this French pressure pipe is depicted in the accompanying illustration from *The Diderot Pictorial Encyclopedia of Trades and Industry*. In the lower right hand corner of this illustration, workmen can be seen chipping off the sand or clay molding material from the surface of a section of pressure pipe. It appears that the molds were filled by tapping the iron directly from the hearth of the furnace into the molds buried in front of the furnace.

Iron Not Oxidized—Being curious as to the composition and metallurgical structure of the early cast iron, a small section was removed for study. Although there was iron oxide on both interior and exterior surfaces, the major section of the pipe was not oxidized.

Using wet chemical and special spectrographic techniques developed to eliminate the effect of metallurgical history, the chemical composition of this old French pipe was found to be as follows:

	per cent
Carbon	3.21
Silicon	0.56
Sulphur	0.067
Phosphorus	0.77
Manganese	<0.01
Chromium	0.021
Nickel	0.012
Molybdenum	0.0015
Copper	0.0056
Aluminum	0.013
Arsenic	0.012
Lead	0.001
Tin	0.005
Titanium	0.01
Vanadium	0.066
Zirconium	<0.02 N.D.

It is interesting to note that there is practically no manganese or copper in this iron, a most unusual condition. The low silicon content and sulphur which has not been neutralized with manganese account for the unusual mottled iron structure shown in the photomicrograph of Fig. 3.

Mottled Iron—A microstructural examination indicates that the microstructure is essentially that of a mottled cast iron. Flake graphite is present in a matrix of pearlite and ternary phosphide eutectic which is associated with cementite. This complex structure is clearly evident in the photomicrograph. The structure contained numerous voids which can be seen in the photomicrograph.

The Brinell hardness of this iron was only 192, but it was impossible to cut this metal with ordinary tools because of the complex phosphide-cementite structure. Knoop microhardness measurements of the carbides ran as high as 1300 KHN.

After examining this pipe, two metallurgical questions are raised that are unanswered:

1. Why is the manganese content of the cast iron so low?
2. Does a highly phosphoric cast iron have superior corrosion resistance?

Do any of you interested foundrymen or metallurgists have answers?

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Fig. 3—Microstructure of pipe cast in 1664. It shows that the iron is a mottled type

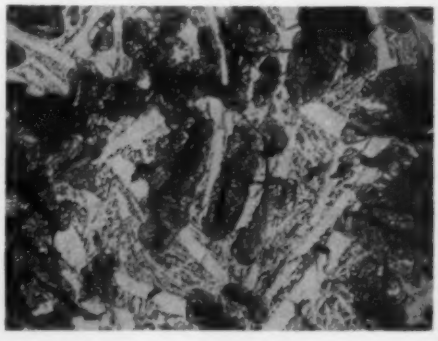


Fig. 1—This section of the old pipe is about 12.5 in. ID. It has a hardness of 192 Brinell

Fig. 2—Illustration shows a foundry like one in which the pipe might have been cast. Note the buried molds in front of the furnace

United States and Canada Have

5879 FOUNDRIES

Total number of plants declines 200 in two years.

Shrinkage is at same rate as in preceding two years.

California tops Ohio as state with largest number of foundries.

● FOUNDRY population of the United States and Canada declined by approximately 200 plants during the last two years to a total of 5879 foundries.

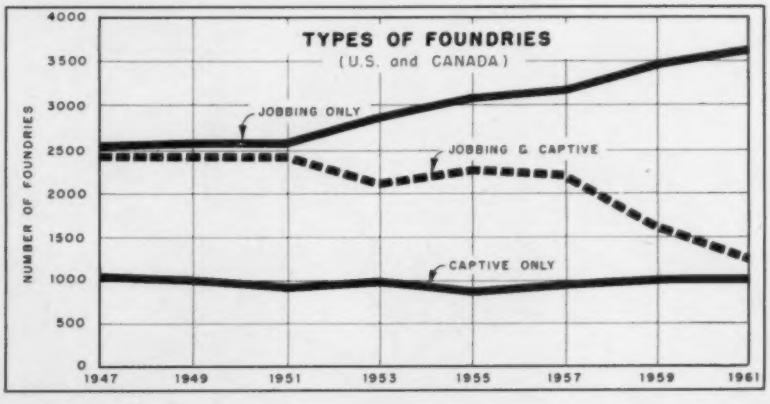
The United States now has 5396 foundries, a decrease of 177 or about 3 per cent since 1959. A drop of about 6 per cent in the number of Canadian foundries reduced that country's total by 29 to 483.

These figures are disclosed by the biennial census of the industry conducted by FOUNDRY and incorporated in the newest edition of *Penton's Foundry List.*

In this latest survey, approximately 600 plants were dropped from the list and 400 new ones were added. Those dropped included foundries which went out of business, or were merged, and captive shops which discontinued casting operations.

Contrary to popular belief, the number of foundries going out of business has not increased during the last two years. The 600 total is almost exactly the same as the loss in the two preceding years, and considerably less than the 710 foundries which were dropped from the ranks in 1957-58.

The net decrease of 206 in number of foundries compares with a loss of 235 plants during the preceding two years. Percentagewise, the reduction between 1959 and



Number of Foundries by Size and Principal Metal Cast

(United States and Canada)

FOUNDRIES EMPLOYING	PRINCIPAL METAL CAST: Gray Iron 1959	Gray Iron 1961	Malleable 1959	Malleable 1961	Steel 1959	Steel 1961	Nonferrous 1959	Nonferrous 1961	TOTAL FOUNDRIES 1959	TOTAL FOUNDRIES 1961
Over 1,000	20	20	3	2	8	5	2	1	33	28
500-999	37	33	11	10	28	27	12	16	88	86
250-499	95	94	28	27	57	53	47	38	227	212
100-249	290	276	36	35	106	105	127	124	559	540
50-99	444	414	13	15	64	63	224	249	745	741
20-49	582	550	2	3	60	65	625	598	1,269	1,216
Under 20	733	653	—	—	51	42	2,380	2,361	3,164	3,056
TOTAL	2,201	2,040	93	92	374	360	3,417	3,387	6,085	5,879

1961 was approximately the same as between 1957 and 1959.

Figures shown in the accompanying table of geographical distribution of foundries refer to numbers of individual plants. In numerous instances, foundries produce more than one type of casting; hence the total number of plants does not represent the aggregate of producers of the various types of metals.

Reductions General — Gray iron foundries showed the largest decrease in number during the last two years with a drop of 156 producers. On the other hand, the total for ductile iron foundries increased by 60. Except for an increase of 16 in producers of zinc castings, foundries making all other types of metals are fewer today than two years ago. Reductions in number of other types of foundries are the following: Malleable, 6; steel, 6; brass and bronze, 104; aluminum, 48; magnesium, 31.

California On Top—The most important change in ranking of various states as leading foundry centers is the ascendancy of California to the top spot. That state showed an increase of one foundry to a total of 544, while Ohio, for many years the leading foundry center, lost 29 plants to a total of 535.

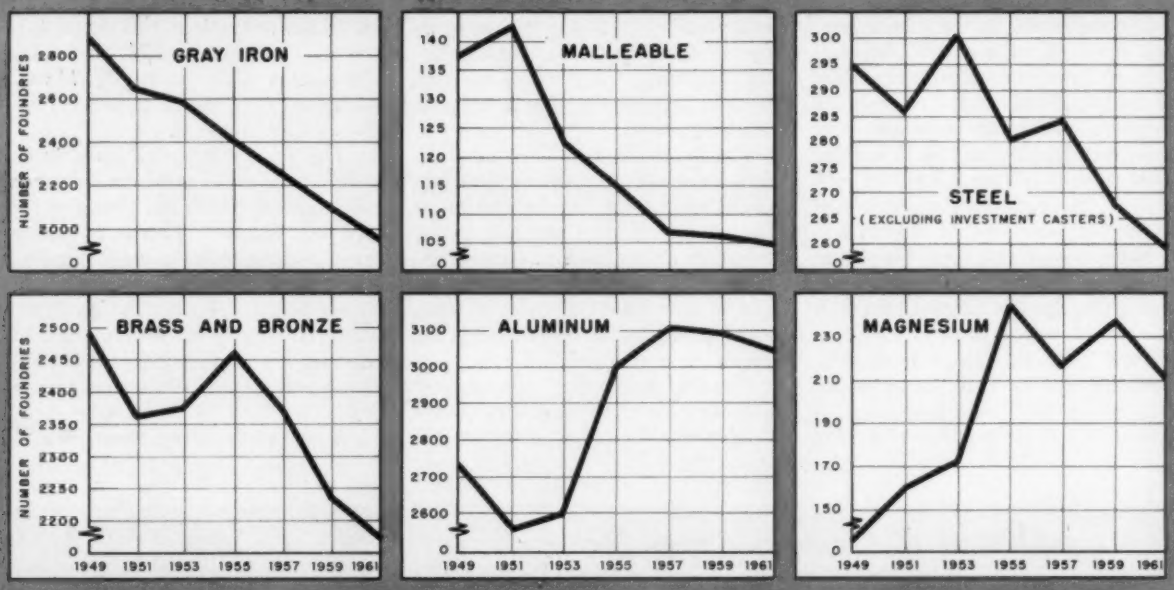
Among the other ten largest foundry states, Pennsylvania ranks third with 486 shops, a decrease of 17 since 1959, followed by Illinois with 447, down 31; Michigan with 426, down 8; New York with 407, down 11; Indiana, 229, down 16; Wisconsin 220, down 8; Massachusetts 281, down 5, and New Jersey 219, down 8.

This survey indicates a continuation of a trend in numbers and types of foundries which has prevailed for the last decade. This is especially true of gray iron castings production, which is being concentrated in fewer but larger capacity foundries. The 2200 gray iron foundries in operation today compare with 3000 ten years ago and 3300 twenty years ago.

A similar declining trend prevails

Geographical Distribution of Foundries

	Total Foundries		Gray Iron Producers		Malleable Producers		Steel Producers		Brass & Bronze Producers		Aluminum Producers		Magnesium Producers		Zinc Producers		Ductile Iron Producers	
	1961	1959	1961	1959	1961	1959	1961	1959	1961	1959	1961	1959	1961	1959	1961	1959	1961	1959
Alabama	96	99	70	67	2	2	10	9	23	26	51	48	1	2	6	7	7	5
Alaska	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Arizona	15	11	6	4	..	..	2	2	9	7	10	7	1	1	2	4	..	..
Arkansas	29	24	10	9	..	..	1	1	10	7	20	16	1	..	9	4	..	..
California	544	543	111	113	4	4	51	49	221	221	367	363	46	44	111	110	17	10
Colorado	55	53	18	20	..	..	5	5	18	20	32	34	..	..	12	11	2	1
Connecticut	142	161	31	34	6	6	11	12	74	79	90	98	7	7	29	32	5	7
Delaware	5	8	2	2	..	1	2	2	3	4	2	3	..	..	1	1	..	..
Dist. of Col.	2	3	1	2	..	1	1	1	2	3	2	3	2	1	1	2	1	..
Florida	72	68	19	19	..	..	1	1	38	40	60	59	4	8	18	17	2	2
Georgia	80	65	36	28	..	..	3	4	21	24	31	35	2	1	4	2	7	2
Hawaii	4	4	3	3	..	..	2	1	3	3	3	4	..	..	1	1	..	..
Idaho	6	5	6	6	..	..	..	..	3	2	3	3	..	..	..	..	..	1
Illinois	447	478	127	136	11	16	31	35	140	150	258	262	14	22	108	110	21	17
Indiana	229	245	87	98	7	6	17	19	74	88	113	118	7	9	16	17	2	3
Iowa	87	81	46	46	1	1	3	1	22	21	47	36	2	3	14	10	4	4
Kansas	48	50	24	24	..	..	3	3	14	14	25	29	4	3	3	3	3	1
Kentucky	31	28	17	18	..	..	1	..	16	12	18	13	1	1	4	5	..	..
Louisiana	25	29	15	16	..	..	6	6	10	10	15	16	..	..	4	2	..	..
Maine	20	19	12	12	..	..	1	1	11	9	12	9	..	1	2	2	..	..
Maryland	34	35	15	15	1	1	1	1	17	18	19	22	2	4	9	3	1	1
Massachusetts	221	226	76	85	5	5	15	13	121	121	140	140	7	9	33	31	8	6
Michigan	426	434	133	141	8	8	33	33	124	135	198	204	20	30	111	100	21	17
Minnesota	87	95	40	46	1	1	6	6	22	30	40	47	4	5	17	15	3	4
Mississippi	14	13	8	9	1	..	..	..	6	6	9	7	..	..	2	1	..	..
Missouri	112	124	34	40	1	1	11	12	39	46	65	70	1	3	18	19	3	3
Montana	6	5	4	5	..	..	..	..	5	4	3	3	..	..	..	..	..	..
Nebraska	23	23	9	10	..	..	1	1	13	12	16	20	..	1	2	3	..	..
Nevada	3	1	1	1	..	..	..	..	2	1	1	..	1	..	..	..	..	..
New Hampshire	22	23	10	9	1	1	3	3	13	13	15	16	1	2	3	4	..	..
New Jersey	219	227	62	65	3	1	19	18	100	101	128	123	11	9	47	43	6	4
New Mexico	5	5	1	1	..	..	..	..	4	5	5	5	1	2	..	..	..	..
New York	407	418	107	121	6	6	32	30	190	194	235	245	14	14	77	87	15	8
North Carolina	66	65	45	48	..	..	..	..	38	40	51	47	2	2	6	4	3	4
North Dakota	3	3	3	3	..	..	..	..	..	..	3	3	..	..	..	..	..	..
Ohio	535	564	183	194	16	16	40	41	195	204	288	293	27	22	82	79	40	34
Oklahoma	47	49	19	19	..	..	2	1	24	25	35	34	..	..	5	6	3	2
Oregon	60	61	23	25	..	..	10	8	22	27	29	29	1	2	10	14	4	3
Pennsylvania	486	503	211	229	15	14	62	63	206	216	234	239	8	10	52	51	33	25
Rhode Island	52	50	10	11	1	2	..	1	23	19	23	21	2	3	12	12	2	3
South Carolina	21	22	14	18	..	..	1	1	18	17	17	17	2	..	1	1	..	..
South Dakota	4	4	3	3	..	..	..	..	2	2	4	3	..	..	1	1	..	..
Tennessee	72	72	50	53	..	..	3	2	26	27	31	34	..	3	8	8	5	2
Texas	164	171	67	72	1	2	13	18	79	82	105	109	9	6	29	32	8	5
Utah	15	16	11	13	..	..	2	2	5	8	7	6	..	..	2	1	3	1
Vermont	11	12	10	12	..	..	..	..	3	3	4	3	..	..	1	..	..	..
Virginia	46	47	37	37	..	..	4	4	27	29	36	38	..	2	4	6	4	4
Washington	68	71	29	32	2	1	18	17	38	37	42	44	2	4	9	15	3	4
West Virginia	30	30	14	14	1	1	2	2	14	14	11	9	..	..	1	1	1	1
Wisconsin	220	228	89	95	11	11	24	23	80	85	109	112	3	4	25	27	18	12
Wyoming	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total U. S.	5,396	5,573	1,959	2,094	105	108	453	454	2,175	2,261	3,053	3,090	210	240	912	902	257	196
Alberta	22	24	11	14	..	..	3	3	9	12	14	15	1	..	2	3	..	..
British Columbia	46	49	20	23	1	2	7	7	23	26	30	27	3	1	8	6	3	5
Manitoba	19	20	13	13	..	..	2	2	5	6	9	9	..	..	3	3	2	2
New Brunswick	10	9	8	7	..	..	..	..	7	6	7	6	..	..	1	2	..	..
Newfoundland	4	4	4	4	..	1	1	1	4	4	3	4	..	..	..	..	..	..
Nova Scotia	16	17	14	14	..	..	2	2	9	10	7	8	1	..	3	3	..	..
Ontario	235	247	106	119	10	11	13	17	108	114	128	135	6	7	38	33	8	6
Prince Edward Is.	3	4	3	3	..	..	..	1	2	2	1	1	..	..	..	..	..	..
Quebec	122	131	71	73	2	2	11	11	52	55	68	72	1	3	17	16	1	2
Saskatchewan	6	7	5	6	..	..	..	..	5	5	6	7	..	..	..	..	..	..
Total Canada	483	512	255	276	13	16	39	44	222	240	273	284	12	13	72	66	14	15
U. S. & Canada	5,879	6,085	2,214	2,370	118	124	492	498	2,397	2,501	3,326	3,374	222	253	984	968	271	211



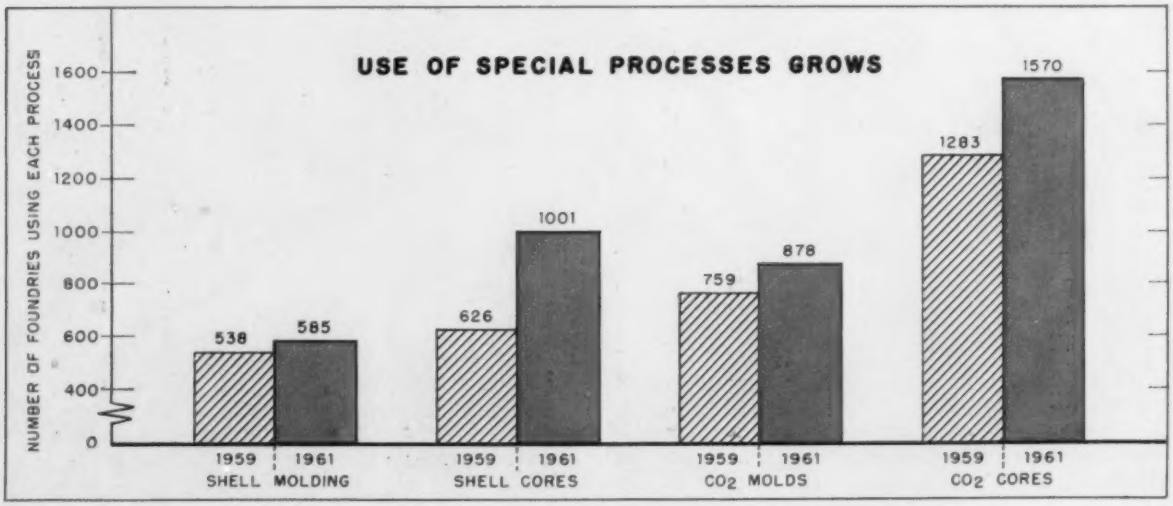
in the number of brass and bronze foundries, and growth in the number of aluminum foundries appears to have passed its peak.

Melting Equipment—The decline in number of gray iron foundries is reflected in the further reduction in number of cupolas in operation to 3057. This figure compares with 4575 ten years ago and with approximately 5000 in 1941.

The number of open hearths in service also continues to shrink, the current total of 110 comparing with 257 twenty years ago. This decline partly is the result of further growth in number of electric furnaces in service. The foundry industry now has a total of 3140 arc and induction furnaces. This is an increase of 260 since two years ago and compares with fewer than 1000 in use in 1941.

Crucible furnaces continue to be the leading type of melting unit, with 14,231 employed, or an increase of 4600 during the last twenty years. Accompanying this increase has been a steady reduction during the same period in number of non-crucible furnaces in service.

Casting Methods—Sand continues as the predominant molding medium, being employed by nearly 80 per cent of all foundries. At the same time, some of the newer molding and coremaking practices have shown further growth in popularity. For instance, producers of shell mold castings increased about 10 per cent the last two years to a total of 585, while the number of shell core users soared about 60 per cent to a total of approximately 1000 plants.



More than one-fourth of all foundries are using the CO_2 process for cores, an increase of nearly 300 foundries since two years ago, and 878 foundries employ CO_2 for mold hardening.

The self-curing type of sand binder has caught on well, as indicated by a total of 1089 foundries which report its use.

The foundry industry continues to be dominated by small plants. Three-fourths of the 5879 foundries in the United States and Canada employ fewer than 50 persons. Only 28 have more than 1000 employees, twenty of these being gray iron foundries. Of the approximately 321 plants having 250 or more employees, about 150 of them are producers of gray iron castings.

The typical nonferrous foundry is small, nearly 90 per cent of them employing fewer than 50. Some 55 nonferrous foundries have 250 or more employees.

Jobbing vs. Captive — No major change is shown in the ratio of jobbing foundries to captive shops in this survey. Such figures, incidentally, reported by the U. S. Department of Commerce for the first time recently, have been tabulated by FOUNDRY for many years. An accompanying chart indicates the trend in types of foundries as to jobbing, captive, or jobbing and captive status; on the other hand, the table divides those foundries which do both jobbing and captive work according to whether one or the other predominates.

Other data revealed by the survey show number of foundries operating the following departments: Laboratories, 1342; pattern shops, 2814; machine shops, 2868; welding departments, 2339. More than 1400 foundries do heat treating, and 1461 operate tool and die shops.

Change apparently is characteristic of the foundry industry. Revisions in the new *Penton's Foundry List*, including names of foundries dropped and those added, plus changes in names and addresses of existing companies, total nearly 2000.

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Types of Molding and Coremaking

	Shell Mold Users		Die Casting Plants		Permanent Mold Foundries		Investment Mold Foundries		CO_2 Mold Users		CO_2 Core Users		Shell Core Users		Jobbing Foundries		Captive Foundries	
	1961	1959	1961	1959	1961	1959	1961	1959	1961	1959	1961	1959	1961	1959	1961	1959	1961	1959
Alabama	14	9	7	10	11	13	1	..	17	8	21	15	24	5	73	69	23	30
Alaska	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Arizona	1	..	2	4	8	4	1	2	4	5	5	5	4	2	12	10	3	1
Arkansas	1	2	15	10	6	7	..	..	3	1	6	4	..	..	21	18	8	6
California	83	53	138	152	108	113	28	25	68	49	120	93	138	103	433	432	111	111
Colorado	..	3	18	14	15	14	..	..	5	8	14	10	3	4	40	39	15	14
Connecticut	10	16	29	37	18	20	7	7	21	18	30	23	21	12	100	111	42	50
Delaware	..	..	..	..	..	1	..	..	2	3	2	4	..	2	4	6	1	2
Dist. of Col.	..	1	1	2	..	..	..	2	..	1	1	1	..	..	1	..	1	3
Florida	7	8	21	18	17	17	1	1	7	6	15	10	7	6	54	47	18	21
Georgia	3	1	5	7	9	12	..	..	12	6	21	9	5	6	43	43	17	22
Hawaii	..	..	1	1	1	1	..	..	1	..	1	..	..	..	2	2	2	2
Idaho	3	..	..	..	..	..	..	..	1	..	2	1	..	..	5	6	1	1
Illinois	55	46	126	134	57	59	13	12	40	43	88	79	82	52	334	351	113	127
Indiana	17	24	35	38	28	37	7	9	31	27	55	44	42	24	164	176	65	69
Iowa	6	4	16	11	12	11	1	1	9	14	26	27	23	8	55	51	32	30
Kansas	2	2	4	6	9	11	..	..	5	3	10	7	7	3	33	30	15	20
Kentucky	1	2	7	6	1	2	1	..	3	4	9	5	4	4	22	18	9	10
Louisiana	1	1	4	2	3	1	..	1	3	3	6	4	4	2	22	24	3	5
Maine	1	..	2	3	1	..	..	..	3	1	4	5	..	..	10	11	10	8
Maryland	2	1	10	4	2	3	..	..	3	6	7	10	2	1	22	23	12	12
Massachusetts	20	15	36	36	27	26	13	8	48	44	78	65	22	13	160	155	61	71
Michigan	51	45	115	125	49	58	16	12	50	50	81	70	69	35	332	339	94	95
Minnesota	8	10	18	17	17	18	2	3	15	17	25	21	23	9	62	66	25	29
Mississippi	..	..	2	1	2	3	..	..	..	1	2	1	2	..	9	7	5	6
Missouri	10	11	25	25	13	11	..	1	10	15	30	22	20	13	78	83	34	41
Montana	..	..	..	..	1	1	..	..	..	1	2	1	..	..	4	4	2	1
Nebraska	1	3	2	4	4	8	..	1	2	3	8	6	1	1	13	12	10	11
Nevada	1	..	2	..	1	1	..	..	..	..	1	..	1	..	..	..	3	1
New Hampshire	5	2	4	6	1	1	3	3	7	6	11	8	6	3	12	12	10	11
New Jersey	27	20	54	53	35	39	13	11	37	26	59	41	27	15	165	171	54	56
New Mexico	..	..	..	..	1	..	..	..	2	1	2	1	1	..	2	1	3	4
New York	44	42	92	102	54	56	38	33	61	55	100	80	59	48	272	283	135	135
North Carolina	2	3	9	8	4	8	1	1	7	4	16	7	3	4	42	40	24	25
North Dakota	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	3	..	..
Ohio	39	47	93	107	75	78	16	17	90	65	167	136	84	45	395	413	140	151
Oklahoma	2	3	7	8	4	2	1	2	12	11	19	17	5	3	34	33	13	16
Oregon	8	12	13	14	9	11	2	3	8	9	17	12	17	14	50	51	10	10
Pennsylvania	44	42	59	64	43	58	15	17	97	77	165	143	78	47	353	382	133	121
Rhode Island	2	1	11	14	6	11	9	5	7	7	14	8	5	1	37	37	15	13
South Carolina	1	1	3	1	4	2	..	..	4	2	6	4	1	1	14	13	7	9
South Dakota	..	..	1	..	1	2	..	..	..	..	..	..	..	..	1	2	3	2
Tennessee	5	3	8	9	8	12	..	..	7	7	17	7	16	3	48	49	24	23
Texas	23	19	30	33	35	30	1	4	47	37	60	47	36	19	125	130	39	41
Utah	3	..	2	2	3	3	..	..	3	2	3	2	3	1	10	12	5	4
Vermont	1	2	1	..	1	1	..	..	1	2	2	2	1	1	8	8	3	4
Virginia	2	..	4	6	2	7	..	..	3	7	10	11	4	5	33	33	13	14
Washington	9	10	11	16	7	9	2	2	15	11	21	18	12	11	52	51	16	20
West Virginia	2	3	2	1	5	3	..	..	6	2	6	5	3	3	24	23	6	7
Wisconsin	32	32	30	36	28	24	2	4	45	38	83	74	54	37	161	167	59	61
Wyoming	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total U. S.	549	501	1,075	1,147	746	810	194	187	822	706	1,448	1,165	921	566	3,949	4,035	1,447	1,538
Alberta	..	..	2	5	6	6	..	..	6	4	8	7	..	1	18	22	4	2
British Columbia	3	4	6	8	7	9	..	1	4	6	13	14	9	8	40	42	6	7
Manitoba	1	..	3	3	6	7	..	..	2	1	6	4	4	1	15	15	4	5
New Brunswick	..	..	1	2	1	1	..	..	..	1	1	1	2	1	5	5	5	4
Newfoundland	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	4	..	..
Nova Scotia	..	..	3	3	2	..	..	..	..	..	..	..	..	..	10	11	6	6
Ontario	27	28	40	41	28	33	7	9	28	30	64	73	52	35	182	188	53	59
Prince Edward Is.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	3	1	1
Quebec	5	5	15	19	14	14	2	2	15	11	28	19	13	14	96	99	26	32
Saskatchewan	..	..	..	..	1	2	..	..	1	..	2	..	..	..	6	7	..	..
Total Canada	36	37	72	81	65	72	9	12	56	53	122	118	80	60	378	396	105	116
U. S. & Canada	585	538	1,147	1,228	811	882	203	199	878	759	1,570	1,283	1,001	626	4,327	4,431	1,552	1,654

9 Ways To Sell More Castings

You probably have good reason to question the practicality of the author's suggested sales tools. But at least they offer a slight diversion from today's more pressing problems . . . and they might even spark the creation of some new and more logical approach

By T. E. BARLOW
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● IN TODAY'S buyer's market, we hear more and more about creative selling. The industry is recognizing that we must learn why people buy and then come up with new and original ways to meet their needs. Creative selling involves using ingenuity to sell (1) more, (2) needs, (3) up, and (4) now.

The foundry industry is no exception to this situation. Real imagination and creative thinking must be brought to bear if the casting industry is to grow at a rate equal to or greater than the growth of the rest of American industry.

The first thing to do is to look at the various devices which have proved their value in other fields. Certainly, some of these proved techniques can be adapted to the foundry industry. Nine really popular selling methods immediately come to mind. Let's study each with the problems of the casting industry in mind.

1

Do It Yourself Market

Here is a real opportunity. Consider the boat business. Today, if you want a boat, you can buy it as a finished product or as a number of kits at various prices—anything from a pile of lumber and a blueprint to a finished, gleaming, white yacht. Why not do the same in the foundry?

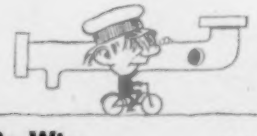
Today, if your customer wants 1000 castings, do you give him a wide choice of buying methods or "kits"? Let's say each casting weighs 15 lb. Why not ship him 1000 kits or packages containing 15 lb of metal, 45 lb of sand, and 2 lb of bentonite, with complete instructions on how to make his own casting? Or he could buy the partially complete job, including a complete mold and 15 lb of metal. Or you could ship the mold with the casting already in it so that all the customer has to do is shake it out and clean it. The possibilities are endless.

2

Instant Castings

This method is an obvious outgrowth of the first. In this case, you make the casting, then grind it up and dehydrate it. All the customer does is to pour the powder into a "cake" mold, add water, and put it in the oven. A few technical problems have to be worked out before this method of selling can be adopted universally, but I am sure the technical ability of our industry is up to the task.

3



Buy By Wire

One of the real inefficiencies of the foundry industry involves the

fact that a manufacturer in Detroit buys castings from Chicago; Chicago buys from St. Louis; St. Louis buys from Detroit; etc. Why not copy the florists?

If you want flowers delivered in New York while you are in Chicago, you call Western Union. So if you run a foundry in Milwaukee and get an order from Detroit, why should you make the castings and ship them all the way? It takes too much time and costs too much for freight. Just call Western Union and let it arrange for the castings to be made and delivered right in Detroit. If everyone cooperates, all of us will be ahead, and the customer will get better service. Ask the florists if this technique doesn't work!

4

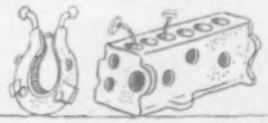
Credit Card Buying

Here is one which really has been ignored. People will buy anything on a credit card. Let your customer buy your castings through the Diner's Club and charge it to his regular account. He will buy more than usual because it's so easy. Besides, "Everybody is doing it." I understand, of course, that the Diner's Club will charge you 7 per cent and that the average foundry profit is 4 per cent, but these details are beyond the scope of this discussion.

5

Casting of the Month Club

This one is a logical outgrowth of the previous idea. People will buy anything sold on a monthly basis. You sell an annual subscription with prices ranging from $15 per year to $1000 per year depending on what market you are after —the poor or the rich. Each month, the subscriber gets your *best* casting to do with what he wants. You even can provide a guide on how your customer can organize a white elephant sale for the church—or a wedding shower —to get rid of his surplus after he has been a member for a year or two.

6 

Gift-Antique Market

Here is a veritable gold mine. Have you ever looked through a gift shop? Why isn't your product there? Everything else is. Or look at the antique market. Is a used horse collar any more desirable than a used cylinder block? Why spend money to melt up these valuable antique castings with this entire market almost untouched. Or, the decorator market? If a beer bottle with a light bulb or a coffee mill with a rose is decorative, why not an exhaust manifold casting with a rosebud in each port? Imagine what an ingenious interior decorator could do with a cylinder block—especially an 8-holer?

7

Discount Houses

A fantastic percentage of the buying done today is done this way. To take advantage of it, however, you may have to change your entire philosophy. When you walk into a discount house, did anyone ever ask you exactly what you want —then make it for you? Of course not. The owners let you walk around and buy what they have for sale.

Why, then, does the foundryman kowtow to his customer? Just make a lot of castings that you want to make and put them on display. Let the customer come to you and look around. If he finds something he likes, fine; if not, that's his tough luck. If *all* foundries operate this way, the customer won't have any choice—unless he is rich and insists on a custom-made casting at a much higher price.

8

Impulse Buying

This item brings us to a really logical marketing device. When your wife goes to the supermarket, does she decide ahead of time what she wants? Not according to the experts. She goes around with an empty basket and a full pocketbook. On impulse, she picks up things that catch her eye. Soon she has a full basket and an empty pocketbook (and if she ends up with a balanced diet, you are lucky).

The message to foundrymen is obvious. Make your castings attractive and put them in every drugstore, department store, and supermarket in the country. Someone will buy.

9

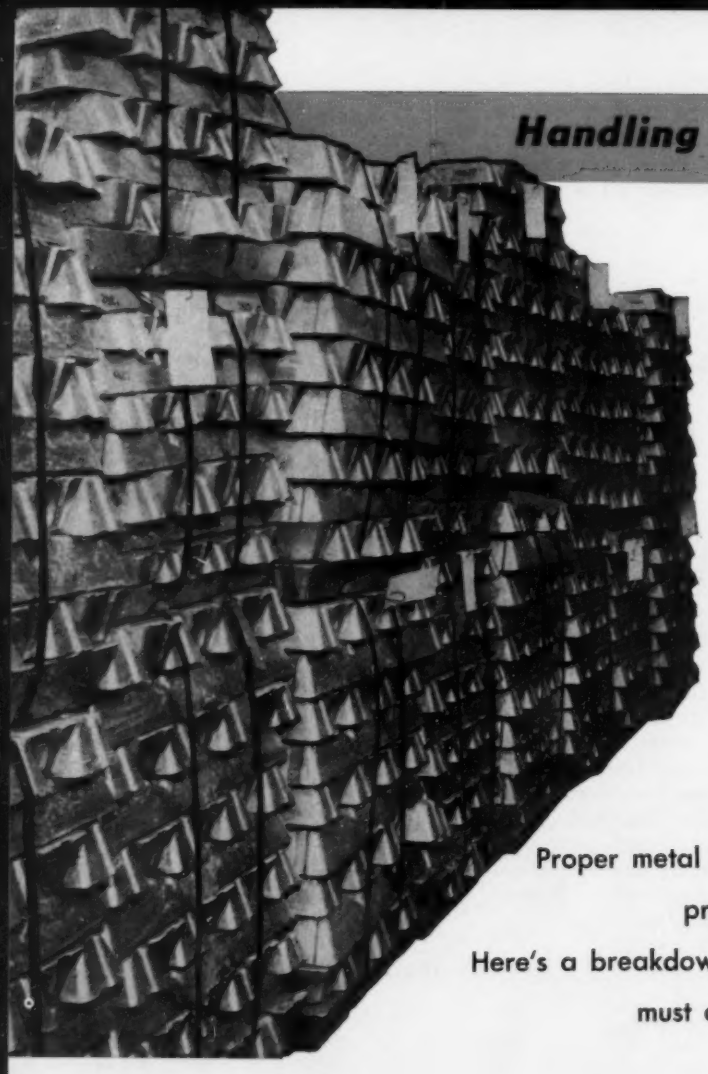
The Hobby Market

The real growth today is in hobby buying. Everyone has one or more hobbies which take a large portion of his income and his time. What has the foundry industry done about this situation? Nothing—or nearly nothing. There is one well known hobby foundry in Michigan, but the market isn't scratched yet.

Here we combine most of the other eight ideas. First, we create the idea that a hobby foundry is the latest thing. We get famous movie stars to pose pouring molds or shaking out castings in their bedroom (preferably these should be girls or starlets). Can you imagine what *Playboy* could do with this one?

Thus we have all nine possibilities to work with—Do It Yourself or Kit Kasting, Instant Casting, Casting of the Month, Credit Card, Impulse Buying, Discount Houses, Gifts, etc. The foundryman's troubles will be over—unless, of course, someone invents a hula hoop and louses up the market.

● For an extra copy of this article, until supply is exhausted, use card on Page 87



Handling and Control of Metal for

Aluminum Diecastings

Proper metal handling and control are essential to the production of quality aluminum diecastings. Here's a breakdown of basic, practical principles diecasters must observe to make such castings consistently

By F. WILLIAM FOSS
Chief Engineer
Apex Smelting Co.
Chicago

● TODAY, aluminum diecasters are being called on to produce castings for applications thought impossible a few years ago. Many of these diecastings are functional parts in complex mechanisms. They require considerable machining over large areas of the casting and must have good mechanical properties.

It has become imperative, therefore, that the castings be free of hard spots and porosity in critical areas in addition to having a good finish and chemical composition within the specification limits. Proper metal handling and control play a vital role in production of quality aluminum diecastings.

This paper originally was presented at the first National Die Casting Exposition & Congress, sponsored in Detroit last November by the Society of Die Casting Engineers.

Experience has demonstrated certain basic, practical principles to which the diecaster must adhere rigidly to make quality aluminum castings consistently. To apply those principles, one first should understand the nature of aluminum —namely, that aluminum and its alloys have a low specific gravity and tend to oxidize readily, absorb gas, and dissolve iron.

Melting Equipment—Many types of furnaces are available to melt aluminum, but essentially they can be divided into two general classifications, fuel-fired and electric. Naturally, there are many types and modifications of the two major classifications, each with advantages and disadvantages. What diecasters must do is to use the best procedure for their own operations.

It is preferable that the melting equipment for a breakdown operation be two furnaces of lesser capacity rather than one big unit. Such a setup makes possible a batch-type operation which metallurgically is considered ideal for the melting and preparation of molten aluminum for diecastings. With this system, one furnace is being charged, mixed, fluxed, etc., while the other is being tapped.

Metal—The first requirement for quality diecastings is use of the best grade of ingot, purchased to a particular specification. Many specifications have too broad a range on

various elements to give consistent castability from one end of the specification range to the other. It often does not make any difference at which end of the specification range the diecaster operates so long as he is consistently at the same end.

For example, an alloy with 9.5 per cent silicon has a slightly different castability from one with 7.5 per cent silicon, although both are within the specification for 380 alloy. Slight variations in impurities such as iron and zinc also affect castability.

The diecaster should, therefore, use an alloy to a particular specification and hold to that specification until such time as a change would be beneficial. This procedure minimizes variation in metal analysis and castability and eliminates one variable in the diecasting process. Every variable eliminated can mean added dollars of profit.

Metal Handling — Aluminum should be stored in a clean, dry place. When it is stored outside and subjected to the elements or to wide variations in temperature, hydrated oxides or corrosion products form on the surface of the metal. A hydrated oxide is aluminum oxide with which water has combined chemically.

Some of the hydrated oxides and corrosion products will not lose their water of hydration (chemically combined water) unless heated to approximately 900° F. Because a slight preheating of the ingots will not correct this condition, it is necessary to wire brush, blast clean, or preheat the ingots to a high temperature before they are charged into the melt.

Charging Metal—To keep castability uniform from one heat of metal to the next, a relatively constant ratio of scrap to ingot must be maintained. Preferably, this ratio should not exceed 40 per cent scrap to 60 per cent ingots. (As used here, scrap means biscuits, runners, and rejected castings.) If the types of jobs being run generate more scrap, and the aforementioned ratio must be changed to possibly 60 per cent scrap and 40 per cent ingot, then additional procedures and precautions should be taken to maintain quality metal. Undoubtedly, for example, more mixing and fluxing will be required.

If dry borings, turnings, and sweepings are to be used, they should be puddled into the liquid metal, thoroughly fluxed, mixed, and pigged, then blended into many heats in small amounts. It normally is best to sell borings or turnings which have been exposed to machining lubricants, oil, or water.

All aluminum melting and handling equipment such as pots, stirrers, skimmers, and ladles must, if made of iron or steel, be cleaned carefully and coated with a refractory wash before first use and at frequent intervals thereafter. For best results, they should be coated while hot, in several thin layers. Thick layers of wash tend to flake off and be carried into the metal.

The initial charge of metal to a reverberatory furnace for each heat should be heavy solids, such as ingots, until a sufficient liquid heel has been obtained to work the bath properly. Then the scrap can be charged and the heat fluxed. Such a procedure minimizes melting loss.

With a pot-type furnace, the heat is started with the scrap to get a heel very rapidly, after which the ingots are charged. This method produces a fast melting rate.

Melting—For best results when a breakdown furnace is used, the temperature of the metal should be raised to a minimum of 1300 and preferably to 1350 or 1400° F. To produce a homogeneous alloy, the melt then should be stirred thoroughly with an absolute minimum of surface agitation.

The metal should be stirred so that it rolls beneath the protective surface oxide film. The mixing operation also helps to insure the proper solution of heavy elements and tends to prevent or retard segregation of those elements at diecasting metal temperature. The precipitation or dropping out of the heavy elements is known as sludging, and the material that drops out is called sludge.

Sludge Formation—Sludge is responsible for one of the types of hard spots which occur in aluminum diecastings. This type consists of metallic inclusions derived from the heavy, undissolved metallic segregation which settles to the bottom of the molten aluminum bath. Sludges are hard metallic compounds of iron and aluminum; iron, silicon, and aluminum; iron, manganese, silicon, and aluminum; and iron, manganese, silicon, chromium, nickel, and aluminum. A typical sludge from 380 alloy, for example, has this analysis, by percentages: Mg, 0.07; Zn, 0.61; Mn, 2.25; Si, 9.50; Cu, 3.00; Fe, 6.00; Ni, 0.45; Cr, 0.65.

Sludge will form if the temperature of the melt is low or if there is a lack of agitation or both. Normally, diecasting temperatures are exceedingly low and consequently are conducive to sludge formation. As a rule, diecasting temperatures cannot be increased to a level where no sludge will drop out if the metal is allowed to remain undisturbed for a long period of time. If at all possible, therefore, metal charged to the holding pot at the diecasting machine should be liquid aluminum alloy from a breakdown furnace in which the temperature has been taken up to 1350 to 1400° F, and it should be well stirred and thoroughly fluxed. Such a procedure provides the best metal possible.

It is essential to prevent wide variations in metal temperature in the holding pot at the machine. Consequently, if a hot charging operation is impossible, another solution may be to add a breakdown chamber behind the pot or dip-out bath so that only liquid metal runs into the holding pot.

If the addition of solid metal to the holding pot is unavoidable, it is helpful to charge preheated small ingots or sections of ingots at regular intervals so as to keep the chilling of the bath to a minimum. Although preheating of ingot is beneficial to the metal quality, it will not prevent sludging. Of the total amount of heat required to raise the charge to casting temperature, approximately 35 per cent is required in the change from solid aluminum to liquid aluminum at the melting point.

It also is important that the metal level in the holding pot not be allowed to get low. Not only may the operator dip into the sludge layer, if one is present, but should a large charge of ingot or scrap be added to the bath, it almost certainly will start or increase sludging. Once sludging has started, it continues because the temperature of the holding spot never is raised high enough to prevent it, nor is there sufficient time to permit complete resolution of the heavy elements.

Agitation can be increased to retard sludge formation, but once sludging has started in the holding pot, agitation of the bath should be discontinued immediately since the operator may entrain sludge in the metal in his ladle, from which it will go into the castings.

Aluminum Oxides—Oxygen combines readily with aluminum to produce aluminum oxide, which forms a cover on the melt. This oxide ordinarily is beneficial on the surface of aluminum, in both the liquid and solid states, because it forms a protective covering which prevents further oxidation and retards gas absorption. When the oxides are included in the aluminum itself, however, they are detrimental.

Oxides are formed easily by excessive surface agitation, splashing, ladling of metal, transferring of molten metal, or whenever else the surface of the melt is broken.

Newly formed oxides are relatively soft, like the oxide film on an ingot. When these soft oxides are subjected to high temperatures, however, they transform into the harder forms of aluminum oxide. The hardest form is known as corundum, which is an abrasive. This oxide presents serious machining problems in diecastings since it either dulls or breaks cutting tools. Oxides also are detrimental in the molten bath because they reduce fluidity.

Aluminum oxides, as well as some of the other nonmetallic impurities, like magnesium oxide, silicon carbide, etc., have approximately the same specific gravity as the molten aluminum diecasting alloy. As a result, some oxides may go to the bottom, some may rise to the surface, and others may remain suspended in the molten bath. It is imperative, therefore, that the metal be cleansed thoroughly by fluxing.

Fluxing—Every year, thousands of castings are scrapped which could have been saved by the proper use of fluxes. Theoretically, under ideal conditions of temperature, pressure, and laboratory handling, it should not be necessary to flux aluminum. Actually, however, no diecasting shop is working under ideal laboratory conditions since it is not economically feasible to do so.

Many materials can be used as fluxes for aluminum alloys. Essentially, they can be divided into either solid or gaseous types. The solid fluxes also fall into two groups —namely, those that form gas and those that form a liquid at the temperature of the molten metal. Perhaps the most commonly used are the solid fluxes that form a liquid at the metal temperature. The principal function of these fluxes is to facilitate a good separation between the oxide and the aluminum.

Fluxes generally are used during and after the melting operation. The flux should be thoroughly stirred in to get as much contact as possible between it and metal. It cleans aluminum by chemical and mechanical action.

When runners, biscuits, rejected castings, etc., are charged, more flux is required than when ingot alone is melted. The reason for this increase is the greater ratio of surface area to the volume of metal being charged. If a good separation of oxide and aluminum is not obtained, a great deal of liquid aluminum is removed with the dross when the metal is skimmed.

At this point, the advisability of using a flux that has a definite end point should be emphasized. With this type, there is a characteristic change in the visual appearance of the dross at the time the molten bath is clean—and only at that time. With the fluxes that form a dry powder when the reaction stops, it is impossible to determine whether or not the metal is clean.

Either solid fluxes that form a gas or the gaseous fluxes themselves are excellent for cleansing and degassing, but they seldom are used by diecasters because of their characteristic fuming and corrosiveness.

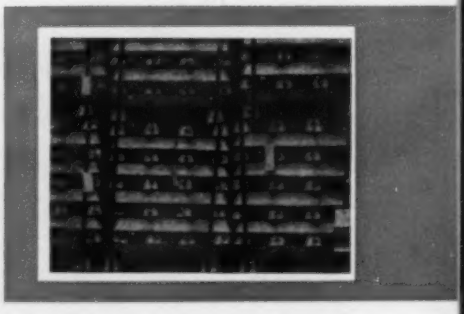
Gas in aluminum normally is not a problem to diecasters because they cast at a low temperature. The solubility of hydrogen at 1200° F and under is low, and what gas is present in the metal tends to remain in solution on solidification because of the extremely rapid chilling in the diecasting process.

It should be noted that because fluxes normally pick up moisture by adsorption or absorption, it is important to keep them dry. It should be stressed that fluxing is a *complement* to good melting practice and an added precaution against the production of scrap.

After a thorough fluxing operation, the melt man should scrape the side walls of the furnace several inches above and below the metal line. The purpose of this step is to remove the little buildup of dross and oxides that occurs at the metal line during fluxing. It is merely a dross removal operation and is not to be confused with a furnace spudding operation.

The dross then is skimmed off, and the melt is allowed to remain undisturbed for preferably 15 to 20 minutes prior to tapping or ladling out. Metal temperature should be maintained at 1300° F minimum. The bull ladle or hand ladle should be clean before metal is added to it. The stream of metal should be constant and should be held to a minimum height when it is poured from the ladle.

If a batch-type operation is used, in which one furnace is being charged, fluxed, etc., while the other is being tapped, the furnace preferably should not be hot cleaned after each heat. A minimum of once per shift is preferable.



Hard Spots—When hard spots occur, it is mandatory that a rapid identification be made so that the diecaster knows exactly in which direction to go.

If the hard spot is aluminum oxide or dross, he immediately should check the following: 1. That the operator at the machine is "backscooping" the metal correctly. 2. Whether or not the holding furnace is clean inside and on the top and that the bath is skimmed properly. 3. That the operator is ladling the metal into the shot well with the ladle touching the well, not dropping metal in from above the well.

These points can be checked rapidly. If they are not the cause of the hard spots, the operator should dip out the sludge and raise the temperature of the melt in the hold-

ing furnace to a minimum of 1200 and preferably to from 1225 to 1250° F. Sludge must be removed prior to fluxing because a fluxing operation does not remove it. Instead, the mixing during fluxing would entrain the sludge in the metal.

It is necessary to go to a minimum of 1200° F because below that temperature the metal is not fluid enough to allow the oxides to float out readily, even though the flux will react at 1150° F or so. It is preferable to use a low-reaction-temperature flux with an end point and to flux the bath thoroughly. The bath should not be disturbed for approximately 10 minutes before any castings are made to keep. Metal temperature should drop gradually until it finally gets down to the normal casting temperature.

If the hard spot is due to sludge, the amount of sludge in the holding furnace will have to be checked.

Should there be very little sludge in the holding furnace, bailing it out usually is sufficient. If the sludge layer is rather deep, however, all of the metal should be removed from the furnace and a fresh start made.

Diecasters with a breakdown furnace should try to attain a temperature of 1350 to 1400° F and to mix the bath thoroughly with a minimum of surface agitation. The level of metal in the holding furnaces preferably should be maintained at more than two-thirds and a minimum of half the capacity at all times during casting. Otherwise, the operator may dip down into the sludge layer. This danger is especially strong on Friday evenings or any time when the furnace will be emptied at the end of a shift. If furnaces are idled over the week end, reducing the temperature increases the problem.

TO PREPARE ALUMINUM FOR QUALITY DIECASTINGS . . .

1. Purchase ingot to specification
2. Write up a metal handling procedure for your operation
3. Identify defects quickly and accurately so that proper steps to correct them can be taken
4. Keep metal temperature at a high enough level
5. Agitate the melt properly
6. Select and use good flux—preferably of the end point variety
7. Use the technical services of your vendors

If the holding furnace contains a great deal of sludge, the diecaster may be better off to bail it out, clean the furnace, and charge clean metal or ingots.

The aforementioned points apply to all types of furnaces, but if a two-chamber holding furnace is used, the breakdown chamber also should be cleaned thoroughly. If breakdown is accomplished in a separate furnace, the easiest procedure is to clean the breakdown furnace, thoroughly flux the bath of metal in it, bail out the holding pot, clean it, and start fresh with a new pot of metal.

Hard spots due to dross or aluminum oxide usually are the result of carelessness in metal handling or housekeeping. If a hard spot is caused by refractory or other foreign material, a thorough investigation of the furnaces or ladle usually reveals its nature. A patch or a new lining may be required.

Porosity—Another common problem is porosity. Again the first step is to identify the type of porosity involved. It can result from trapped air, volatilization of excessive die lubricant, or shrinkage.

If the problem is trapped air, a change of gating or venting or a variation in die or metal temperature may be required.

If the porosity is due to excessive use of die lubricant, the operator should restrict its use as much as it is possible to do so and still run the job. The tendency of most operators is to use too much lubricant. On some jobs, where a die must be sprayed well after every other shot or so, additional venting may have to be provided to take care of the additional gases.

If the problem is shrinkage, possibly more or less heat is required in the die at various areas, and increasing or decreasing of the flow of coolant through the die at those areas may be beneficial. Variation of metal temperature also may help. In stubborn cases, changes in gating or venting are required.

Laminations — Laminations, or cold flow, usually can be eliminated by more heat in the die or by higher metal temperature. If they do not work, a change in gating or venting is required after varied pressures and cycles have been tried.

On jobs where casting requires a great deal of machining, it may be worthwhile to use straight ingot and a more rigid melting and fluxing procedure than on jobs where there is no machining.

Efficient Use of Metal — Every diecaster should investigate all of his melting and metal handling operations to determine whether or not he can obtain better metal recovery. If he can save only 2 per cent, he will recover approximately ½ cent per pound of aluminum melted. Increasing the metal recovery may involve such changes as adding an open puddling well to a reverberatory furnace, changing burners or direction of flame, etc. Any savings made will be in addition to what may be saved by the reduction of scrap.

Summary — It is recommended that each diecaster purchase ingot to a particular specification and that he write up a metal handling procedure for his own operation. Both should be followed to the letter, consistently and constantly, although necessary changes should be made as required.

When a problem is encountered, it is imperative that an accurate, rapid identification of the defect be made so that a correct solution may be obtained.

Increased metal temperatures and proper agitation of the melt definitely are beneficial. Selection and use of good flux are complements to good melting procedures. In the selection of a good flux, an end-point type offers benefits. In setting up his procedures and specifications and in solving his problems, the diecaster should use the technical services of his vendors.

● For an extra copy of this article, until supply is exhausted, use card on Page 67

QUESTIONS and ANSWERS

- **Grinding ball gating system must insure adequate feeding to provide a solid product**
- **Lack of sonorous sound in tone of small bronze bells may be due to a number of factors**
- **Warping of chills used in producing double flanged wheels can be overcome in several ways**
- **Requests suggestions relating to melting operations in the cupola to provide improved practice**

Gating for Grinding Balls

In our foundry in Columbia we are interested in making cast steel and alloy cast iron grinding balls from 2 to 4 in. in diam in sand and in chill molds. Can you supply any information on the methods of gating and risering such castings?

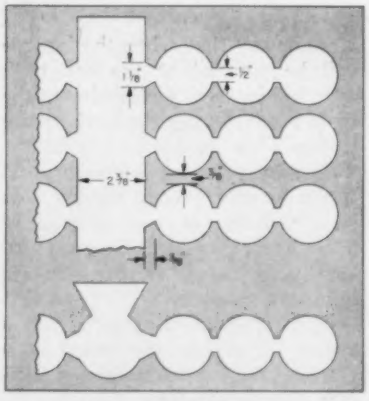
One method for producing alloy cast iron grinding balls in sand molds is indicated in the accompanying sketch with information on various dimensions for the 2-in. size.

Note that the balls on the runner, except the one attached to the runner, are close together to insure feeding. Spacing is 1/16 in. As the size of the balls increases, the number of balls attached to the runner decreases, and with the 4-in. size, only one should be used.

Runner size increases with the size of the ball and for a 4-in. ball is 3⅝ in. in diam. Opening from the runner into the ball is increased to 1½ in., and the attachment at the ball is 9/16 in. Number of rows of balls may be as high as 7 on each side of the sprue when placed in the center. You will have to experiment to determine the most suitable arrangement for your conditions.

Chill-cast grinding balls are made in gray iron molds split vertically. Usually one half of the mold is fixed, and the other half moved back and forth by a hydraulic or pneumatic ram which also provides the locking means.

Number of balls in the mold depends on the size. In the case of the large balls, only one is made.



One method of gating grinding balls

Smaller balls are arranged in several rows attached to a central vertical sprue somewhat as shown in the sketch, where the runner is considered as being in the vertical position. The sprue probably can be reduced in size through experiment. Also, you might try using a split dry sand core with suitable openings in the sprue cavity. That technique would decrease the rate of cooling in the sprue and promote feeding.

Small Bells Have Bad Tones

We manufacture small bronze handbells used in bell-ringing performances and often run into a problem of bells with bad tones. The bells are made in green sand, and the bad tone seems to be caused by stress in the metal. Thickness of the walls may be uniform but the fundamental (pitch) tone has too many beats caused by a variation of frequencies as much as 50 per cent of the semitone. Could you suggest a method of heat treating the alloy (85 Cu-15 Sn) to relieve stress?

Sometimes the bell may sound good when cast but will develop a bad beat during finishing. We use a rotary carbide file for taking off the rough surface and a rotary sanding wheel for cleaning up. No cutting tools are used. Does this indicate that a stress is developed with removal of metal, or that the stress is relieved and causes the change?

As you undoubtedly know, bell manufacture is a specialty operation and literature on the subject is sparse. It mainly covers generalities, and is quite sketchy on problems such as you mention.

Although casting strain might cause the lack of suitable tone, we suspect that it is due to lack of soundness or of suitable microstructure. Copper-base alloys tend to pick up gases during melting, particularly when the operation is slow, the furnace atmosphere is reducing, or when the alloy is left in the furnace at high temperature for extended periods of time before pouring. The gases in the metal result in unsoundness.

Another possibility is that internal shrinkage areas develop due to lack of proper feeding when metal is poured at too low a temperature.

With reference to microstructure, indications are that it should be an

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alpha solid solution plus an alpha-delta eutectoid constituent. The latter is an intimate mixture of alpha and delta, and the pleasing sonorous quality of bell metal is ascribed to the amount present and its distribution in the alpha solid solution. Usually under the cooling conditions encountered in the mold, the desired structure results. With high pouring temperatures, however, cooling is slower than with normal pouring temperature, and it is possible that the desired structure will not be obtained.

Hence, it is advisable to establish a pouring range which will insure satisfactory results, and of course will have to be determined experimentally. Unfortunately, there is no specific information on the particular composition you are using, but for a wide range of tin-bronzes the range is given as 1950 to 2250° F. With thin sections in the small bells you are making, the temperature will be toward the upper side.

Sometimes an insight on possible defects and their causes can be obtained by study of the fractures of good and bad castings, but that requires some experience. Indications are that the fracture should be a gray-white color with a reasonably fine grain structure. Yellowish or brownish discolorations in the fracture may be due to gassy metal or shrinkage, or both. If the grain structure is coarse, the pouring temperature was too high.

Your mention of taking off the rough surface of the bells with a rotary file appears to indicate that your sand is too coarse. A sand of suitable fineness should give a relatively smooth surface which can be brought to a high state of finish with minimum use of polishing and coloring wheels.

Has Warping in Wheel Chills

From time to time we make double-flanged, chilled tread wheels similar to crane wheels. For chilling we use a split chill bolted together. However, the chills warp out of round after a few wheels have been made. Have you any suggestions which might overcome that difficulty?

One possible cause of the warping of the chills may be the type of iron employed. Better resistance to heat or thermal shock is obtained with high total carbon irons. Addition of a small amount of chromium or molybdenum or both should increase the heat resistance of the iron.

It may be that the thickness of the chills is not enough to absorb the heat from the metal poured against it without the chill's being raised to a high temperature throughout. You might try cutting narrow vertical slots in the chill faces. Make them about 1/16 in. wide, 3/8 in. deep, and 2 to 3 in. apart. Slot openings at the chill face can be filled by applying a coat of blacking and rubbing it in. Dry the chills thoroughly before use.

Cupola Melting Rate Is Good

We are melting in a cupola lined to about 44 in. at the tuyeres and 47 in. in the well, or deep enough to hold four 1000-lb charges. Our practice is to tap into a 2-ton ladle when four charges are melted. The iron is good and hot. Is it good practice to hold that number of charges in the well before tapping? We might point out that it takes about ½ hour after the blast is on to melt the first four charges; then four charges melt every 10 minutes. Heat is 12 tons.

Usual objection to holding molten iron in the well of the cupola is a drop in temperature unless the coke bed is good and hot and the possibility of a pickup in carbon if that is a factor. Since you mention that your iron is good and hot, the operating conditions are satisfactory in that respect. According to your figures, you are melting at the rate of 9 tons per hour, which leaves little room for complaint. Possibly you could cut off about 10 minutes on the first tap by reducing the coke bed. Usually a good melting rate is attained 8 to 10 minutes after the blast is turned on.

You state that it takes 30 minutes for the first four charges, but only 10 minutes for succeeding batches of four charges. That condition would indicate that 10 minutes are spent burning excess coke in the bed to bring it down to the operating level. You could try a gradual reduction of the coke in the bed, observing carefully the effect on temperature of the iron throughout the heat.

Use of Limestone in Cupola

We operate a small cupola lined to 28 in. in diam and usually pour two heats a week which run about 7500 lb each. We use 600 lb of coke in the bed and 1000-lb iron charges with 150 lb of coke between. We would like to know how much limestone we should use between charges and on the bed if that is necessary. Also, should the slag hole be open during pouring?

General practice is to use limestone equal to 3 per cent by weight of the iron charge between charges and about twice that amount on the bed. Limestone preferably is placed in the center so that it is away from the lining. We believe the slag hole should be opened just before the slag reaches the tuyeres.

Indications are that liquid slag is about one-third the weight of iron, and the 285 lb of slag generated would occupy a considerable height in the cupola, probably about 10 in. To hold that amount of slag as well as the usual amount of iron in the well, the tuyeres would have to be located quite high above the bottom plate. Also, that amount of slag would make quite a mess when the bottom is dropped.

The slag hole should be opened as soon as the slag rises a few inches above the hole, and of course, before the slag reaches the tuyeres. That can be determined by keeping a close watch at the tuyeres after melting begins. With a constant melting rate you can determine the time for opening by calculation.

For example, if the tuyeres are 18 in. above the sand bottom, and the slag hole 4 in. below the tuyeres, the well has a volume of about 8600 cu in., of which about 47 per cent is occupied by the choke, leaving about 4000 cu in. for the iron and slag. If the iron weighs 0.26 lb per cu. in., the well could hold 1040 lb of iron.

If the cupola is melting at the rate of 2 tons per hour or 67 lb per minute, the iron would reach the slag hole in about 15½ minutes. Since you do not want the iron to get that high, the slag hole should be opened a few minutes before that time. Since a short time —8 to 10 minutes—is required for the iron to approach the melting rate after the blast has been turned on, usually 8 to 10 minutes,

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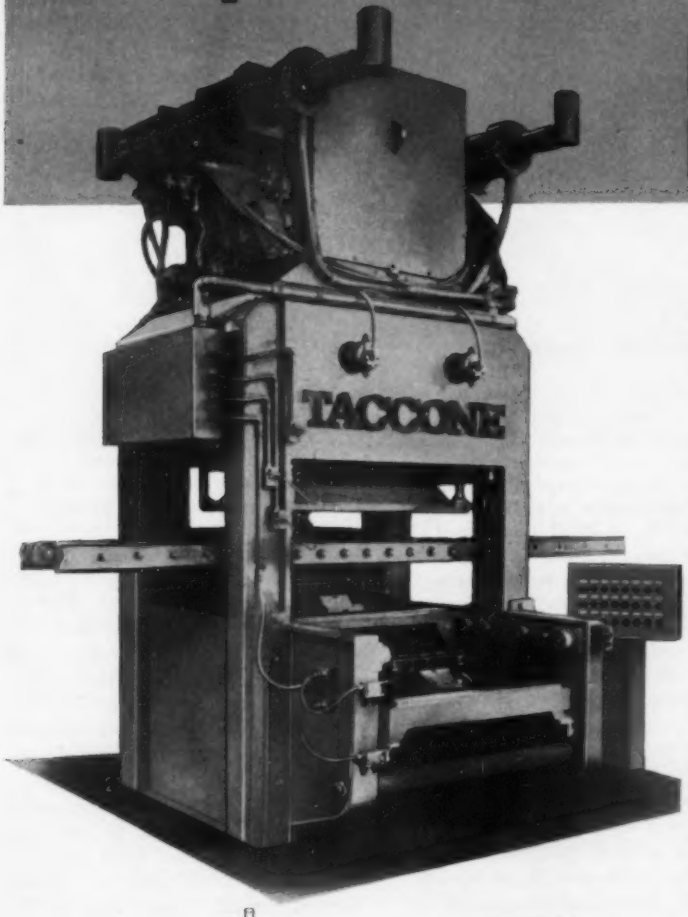

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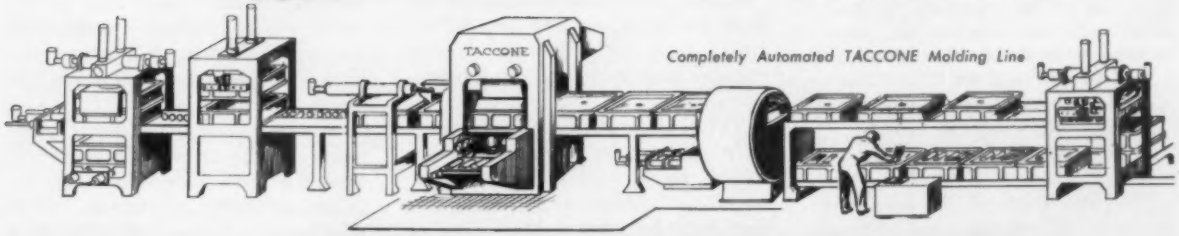

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For More Information Circle 581, Page 87

that time would have to be included. That is, from the time the blast is turned on, the iron would reach the slag hole in 23.5 to 25.5 minutes, and the slag hole would be opened in 20 to 22 minutes.

Prevents Entrance of Dirt

Can you throw any light on whether there is any advantage in placing a piece of paper on top of a riser opening? In our foundry the riser height is extended by use of a bush or box, and the paper is placed over the opening in the mold before setting the box in place.

So far as we know, the only advantage in covering the riser or sprue opening in a mold with a piece of paper is to prevent entrance of dirt into the mold cavity.

In your case where the extension box or bush is set in place after the mold is made, the precaution of placing a piece of paper over the hole is excellent practice. Usually there is some loose sand on top of the mold or perhaps on the bottom of the box, and when the box is put into position the loose material falls into the mold cavity, causing trouble and raising the question of where the dirt came from.

Material for Foundry Floors

Can you supply any information on what type of floor surface is recommended for the pouring area in a foundry? At present the floor area of our foundry, 90 x 290 ft, is dirt, which is moistened once or twice a day to keep down the dust. The employees prefer this floor to prevent fire hazard and to control splash or overflow. Suggestions submitted with the view of increasing eye appeal and cutting down on dust include pouring oil over the dirt to cut down the dust and covering the area with firebrick, concrete, or metal slabs. Core breakout and furnace areas are floored with steel plate, and the galvanizing area is concrete slab.

It is our opinion that the majority of the modern foundries have concrete floors throughout, although in some areas, such as around furnaces and cupolas, hard-burned paving brick and figured-surface steel or cast iron plates sometimes are used. As far as metal splashes are concerned, we do not believe that the effect will be much different than in the case of the hard-packed dirt floor. In the case of runouts from the molds, the usual practice of throwing molding sand on the molten metal is followed to stop the spread and speed cooling. However, the hot metal should be removed as soon as possible to prevent spalling of the floor.

Some years ago an experienced hand recommended a suitable concrete base with a ¾ to 1-in. thick top finish composed of 1 part neat cement and 2 parts 40 to 60-mesh silica sand. Other proprietary top finishing materials include metallic or abrasive aggregates. Where hard-burned brick are used, they are laid on a concrete sub-base covered with about 1 in. of sand. The brick are placed closely together, and thin cement grout is brushed and worked into the joints to hold the bricks together.

Bid Includes Specifications

In bidding on various requirements including manhole rings and covers and catch basin castings, we find that the bid specifies material used in the manufacture of the castings shall conform to ASTM A 48-48 class 30, or U. S. Government Specification QQI-652. Can you give us information on those and on the composition of metal charges to meet the requirement? Our cupola charges now are comprised of 300 lb pig iron, 600 lb scrap, and 100 lb steel scrap.

Apparently the specification calling for ASTM A 48-48 on Gray Iron Castings is an old one since that was revised in 1956 and again in 1960. It now is designated A 48-60T. As indicated in an article, "Revised Specifications for Gray Iron Castings," in the September, 1960, issue of FOUNDRY, major changes have been made in the specification.

These are relative to employing only the tensile strength test, although by agreement between producer and consumer the transverse test may be used. Also, sizes of test bars for different section thicknesses are included. Complete details of the specification A 48-60T may be obtained from the American Society for Testing and Materials, 1916 Race St., Philadelphia 3, Pa., for $1.

The class 30 iron refers, as you might suspect, to the tensile strength and calls for 30,000 psi minimum in the 1.2-in. diam test bar. That is the B bar covering casting sections from 0.51 to 1.00 in. thick. Specification QQI-652 is a Federal specification, and conforms to A 48.

Although we cannot be definite, we believe that your present metal charge into the cupola will contain about 2 per cent Si over the spout and will show a tensile strength somewhat above 30,000 psi. The only way to establish that fact is to make a number of test bars according to the method described in the specification and determine the tensile strengths.

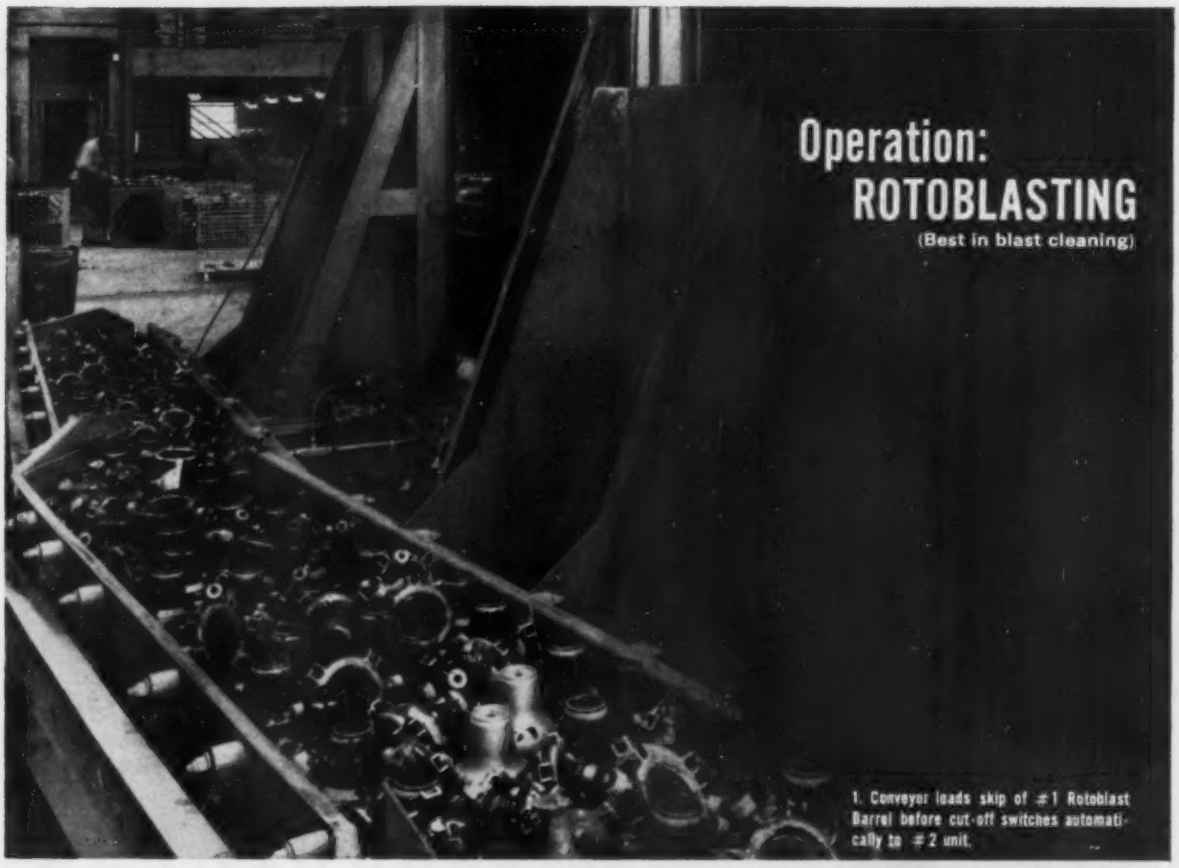
Hardening of Wheel Treads

We manufacture a variety of I-beam trolleys, using chilled rim trolley wheels of different sizes which are not used in large volume. Each size of wheel requires a chill and makes the cost of the wheel rather high when only four or five might be used in a year. We would like to find out whether there is a cast iron mixture that would provide wheels with the same life as chilled type without the necessity of using chills.

So far as we know there is no gray iron composition, plain or alloyed, cast in green sand which will give the same service as chilled-tread wheels. Surfaces of unchilled wheels can be treated to provide hardness and wear resistance, but whether they would equal the chilled wheels is another matter.

Possibly addition of small amounts of tellurium to the iron poured into a green sand mold, or a tellurium mold wash or coating applied to the tread area in the mold, would produce a satisfactory product. Tellurium is a strong carbide stabilizer and will result in white fracture iron.

Another possibility is flame hardening of the tread and flange of low-alloy iron wheels, but that requires additional equipment, cost of which might be too high when only a small number of wheels is involved. We believe that the best solution of your problem is to standardize on the few sizes of wheels for which chills already are available.



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2. Skip fills second unit with exact pre-determined load for cleaning.

3. Cleaned castings move on take-away conveyor to next operation.

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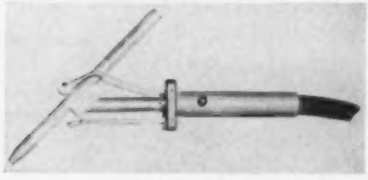
METAL REMOVAL TORCH

Metal removal torch uses the carbon arc-air process for pad washing and removal of exterior fins and sprues in steel foundries. Known as the Model V, the unit features a spring steel wire guard surrounding the head which prevents accidental



arcing, yet open-head construction permits good working visibility. Air supply is controlled by a pushbutton, and air pressure required is 80 psi. The torch comes in sizes for use with 1/4, 5/8, or 3/4-in. electrodes and requires current of 400 to 1600 amp, depending on electrode size and type of work. A 3/4-in. concentric cable assembly is furnished with the torch.—**Arcair Co.**, P. O. Box 431, Lancaster, Ohio.

For More Details Circle No. 451—Page 87

OPTICAL PYROMETER

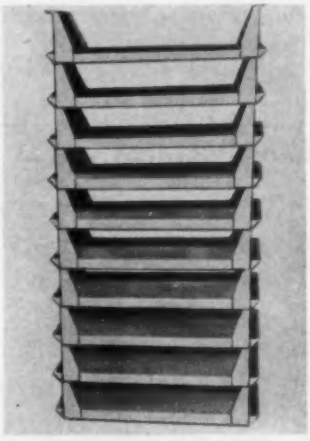
Pyro-650 is an optical brightness pyrometer designed for continuous recording and controlling of tem-

peratures in the range from 1200 to over 7000° F in applications where thermocouples or total radiation pyrometers cannot be used. By eliminating the need for manual operation, required by other optical brightness pyrometers, this unit is claimed to provide more efficient process control and greater repeatability.—**Instrument Development Laboratories Inc.**, 67 Mechanic St., Attleboro, Mass.

For More Details Circle No. 452—Page 87

CORE TRAYS

Core trays are designed to lock together when stacked for storing cores. They also can be used for baking the cores. Made of 16-gage steel, the trays are 12 x 24 in. with

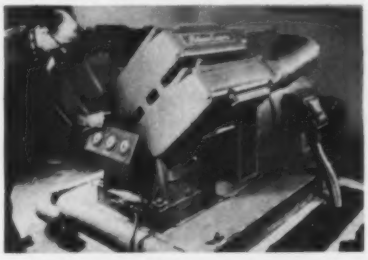


a loading height of 4 1/2, 6, or 7 in. The trays also can be made to customer's specifications.—**Arco Welding Service**, 4727 S. Hoyne Ave., Chicago 9, Ill.

For More Details Circle No. 453—Page 87

AIR COMPRESSOR

DT4 air compressor is rated at 100 hp and will deliver 509 cfm when running at 870 rpm and 565 cfm when running at 970 rpm, both at 100 psi. Maximum working pressure is 125 psi. The compressor, which is 57 in. wide, 49 in. deep, and 46 in. tall, weighs 2200 lb. It is a short-stroke, two-stage, double-acting, fully aircooled type driven by electric motor or diesel engine via a flexible coupling. Two separate lubrication systems, one for all bearings and one for cylinders, take their oil from the crankcase oil sump. This arrangement eliminates daily filling of the cylinder lubricator and enables the unit to run

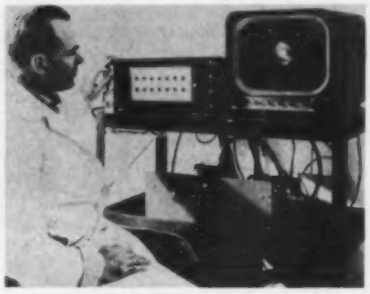


for two weeks before oil must be added. The compressor is designed for stationary use but can be mounted on bonded rubber for semi-portable installations.—**Atlas Copco Inc.**, 545 Fifth Ave., New York 17, N. Y.

For More Details Circle No. 454—Page 87

IMAGE INTENSIFIER

Gamma ray image intensifier system transfers gamma ray energy from a cobalt source to electrons of low enough intensity to produce a fluoroscopic image. This image



is intensified by a special tube in the system to produce a picture at the other end that is about 1000 times brighter. The picture is bright enough to be viewed by a remote TV screen or by a direct optical system. With the intensifier,

gamma ray inspection facilities can be used for continuous inspection of castings on a conveyor.—**Rauland Corp.**, subsidiary of Zenith Radio Corp., Chicago, Ill., and **Waite Mfg. Div., Picker X-Ray Corp.**, Cleveland, Ohio.

For More Details Circle No. 455—Page 87

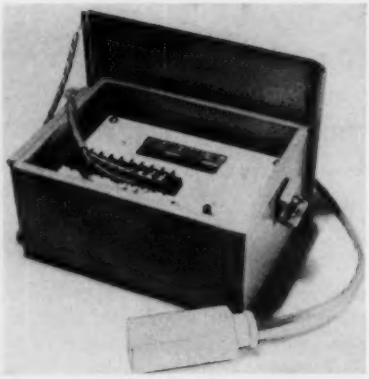
MELTING FURNACE REFRACTORY

Castable refractory is high in alumina and low in silica content and is for use in lining aluminum melting furnaces where severe operating conditions might be encountered. The material is said to reduce metal loss through oxidation, resist thermal shock, resist abrasion and destruction from impact, and facilitate easy dross removal. It is strong and dense with high volume stability.—**Kaiser Refractories & Chemicals Div., Kaiser Aluminum & Chemical Corp.**, Kaiser Center, 300 Lakeside Dr., Oakland 12, Calif.

For More Details Circle No. 456—Page 87

PROXIMITY LIMIT SWITCH

Proximity limit switches are designed to be used where limit switch operation is called for, but environmental or operation requirements prohibit the use of standard mechanical units. The pickup measures 1⅛ by 1⅛ by 4¼ in. and is sensitive to both ferrous and nonferrous metals without critical setup adjustments. It is not affected by dirt, moisture, or oil and will not attract metal chips.



Actuation of the switch is caused by a metal object moving within 1 in. of the pickup, where it distorts an alternating magnetic field. Distortion of the field is sensed by the pickup, and a voltage is developed which is used to operate a relay in the control unit.—**Electronic Signals Inc.**, P. O. Box 3811, Cleveland 10, Ohio.

For More Details Circle No. 457—Page 87

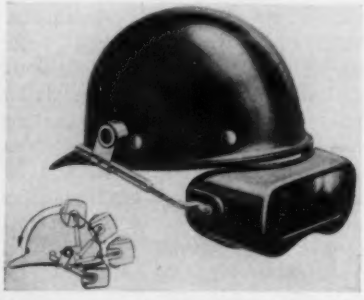
SILICON CARBIDE BRIQUET

Ferrinox 85 is a silicon carbide briquet formulated to provide 3 lb of silicon per briquet. Adding this material is claimed to deoxidize iron, increase fluidity, and improve cast structure. Each briquet contains a catalytic and activating agent and an expanding material to promote dispersion throughout the metal.—**Merit Corp.**, 2400 S. 43rd St., Milwaukee 46, Wis.

For More Details Circle No. 458—Page 87

GOGGLE ATTACHMENT

Side-arm attachment is designed to combine goggles with safety caps for workers who require fulltime head protection with intermittent eye protection. The goggle extends



over the cap bead and rests anywhere on the cap so that it is out of the way and gives proper balance on the worker's head. The telescoping aluminum arms are adjustable as to tension for full comfort, with the goggle or goggles resting easily on the face. The unit is of sturdy construction and contains no parts that might crack, break, or corrode.—**Fibre-Metal Products Co.**, Fifth & Tilghman Streets, Chester, Pa.

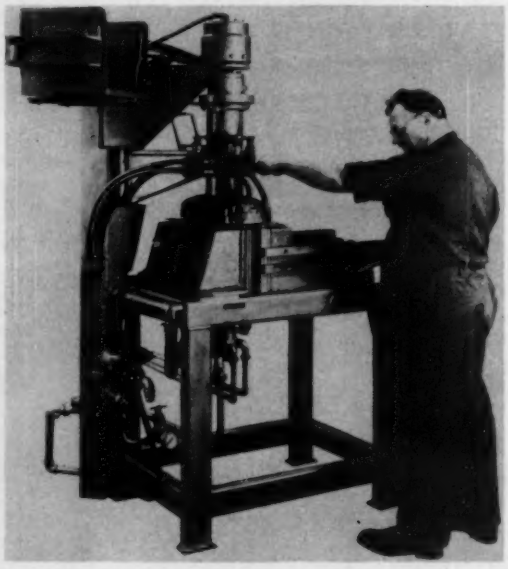
For More Details Circle No. 459—Page 87

X-RAY ROLL FILM

Industrial x-ray film is available in roll form in 16, 35, and 70mm width in both Type AA and Type M. Film, except for 16mm, is furnished wrapped in a light-tight disposable envelope and wound on 200-ft reels which have 12-in. diam cores with 3-in. mounting spindle holes. To use, film is cut to length in a darkroom, and black opaque

Small Coremaking Unit Makes Furfural Cores

Furfural coremaking machine, Model FC-12, is designed for short-run operations.



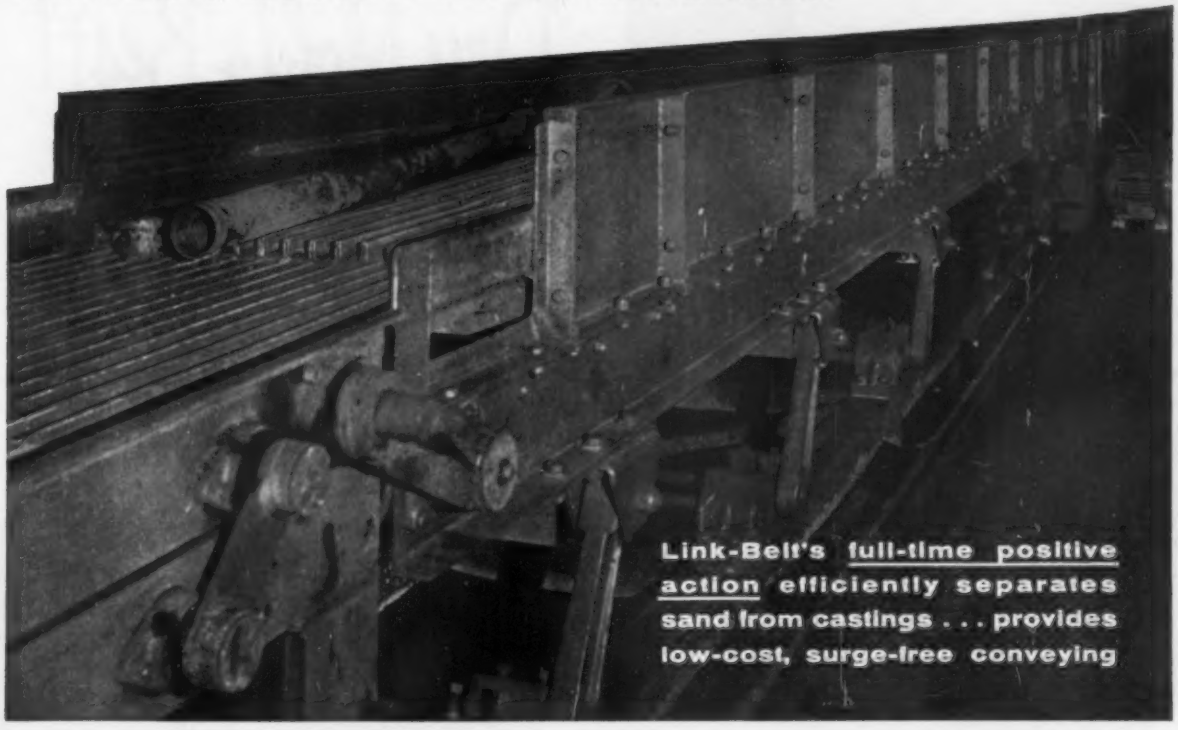
Machine takes floor space of 74 by 43 in., and the over-all height is 79 in. The unit is operated manually and requires connection only to gas and air lines. A gas-fired preheat chamber provides operating temperatures from 400 to 500° F. The carriage frame is opened and closed by a handwheel, and a single duplex valve controls locking and blowing operations. The blow head swings easily from refill to blow position. Coreboxes can be accommodated in sizes from 6 to 16 in. long by 3 to 10 in. wide by 3 to 6 in. thick.—**SPO Inc.**, 6448 Grand Division Ave., Cleveland 25, Ohio.

For More Details Circle No. 478—Page 87

LINK-BELT OSCILLATING CONVEYORS

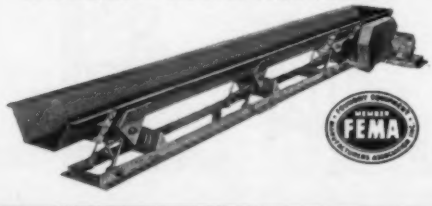
take "positive action"

HANDLING HOT-AND-HEAVY MATERIALS


Link-Belt's full-time positive action efficiently separates sand from castings . . . provides low-cost, surge-free conveying

TORQMOUNT uses torsion bar springs. It is designed for severe service . . . capacities up to 350 tph. Available in 20- to 48-in. widths with 8-in.-deep troughs. Popular 36-in. size stocked.

COILMOUNT uses coil springs. It is designed for moderate duty . . . capacities up to 80 tph of 100-pounds-per-cubic-foot material. Available from stock in 5- and 10-ft. lengths, 10- and 20-in. widths . . . with 6-in.-deep flared troughs. Heavy-duty Coilmount is available in standard 5- and 10-ft. lengths, 20- and 24-in. trough widths.



Conveying jobs get done fast and easy with Link-Belt oscillating conveyors. Even heavy surge loads can't dampen the efficiency of their *full-time positive action* that quickly smooths out *any* load . . . keeps material moving in a continuous, uniform flow.

The double-deck Torqmount unit above demonstrates the efficiency—and *versatility*—of Link-Belt oscillating conveyors. *Positive action* quickly separates sand from the red hot cast iron pipes. And while the bottom deck carries the sand to a reclaim conveyor, the pipe is conveyed smoothly on upper deck to discharge point . . . cooling en route.

Link-Belt Torqmount and Coilmount oscillating conveyors perform as near to *natural frequency* as possible to minimize power requirements. Further economy is assured through simple, all-metal design that holds down maintenance costs. For full details, contact your nearest Link-Belt office. Ask for Book 2744.

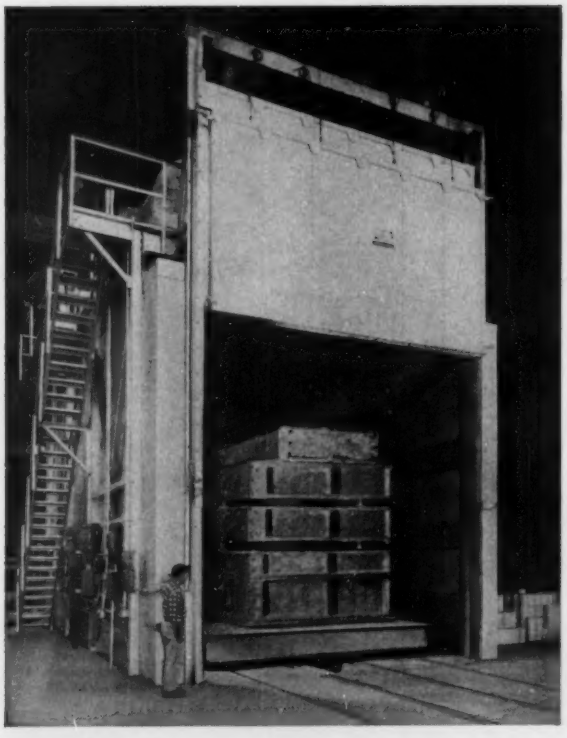
LINK-BELT

OSCILLATING CONVEYORS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses and District Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs; Switzerland, Geneva. Representatives Throughout the World. 15.054

For More Information Circle 584, Page 87

SURFACE DRY or "BONE" DRY
COLEMAN OVENS



Dry Molds Best!

Below: Two Coleman *JET-ACTION®* High Speed Mold Ovens in a gray iron foundry dry up to 60 molds per day.

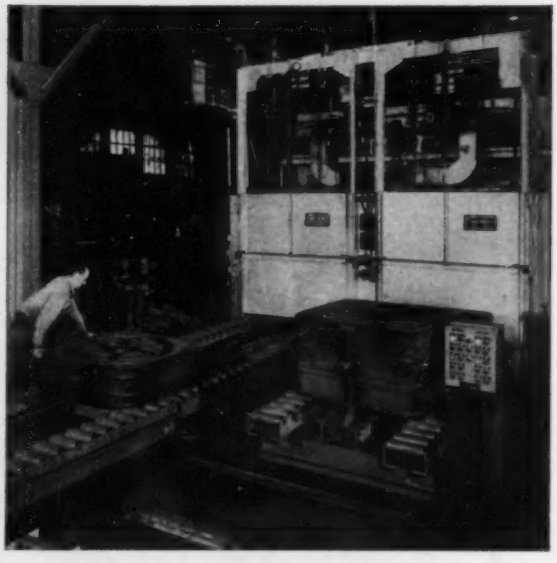
Ingenious push button controls enable one operator to index cope and drag molds through the oven on a semi-continuous conveyor system. Ovens are heated by individual *JET-ACTION®* Recirculating Systems.

Coleman *JET-ACTION®* Ovens provide such benefits of dry sand practice as better casting finish—fidelity to pattern—lower cleaning costs with added advantages of reduced handling costs and accelerated flask turnover.

Above: Car-Type Mold Oven in leading steel foundry is one of the largest in the world. Door opening is 16 feet wide x 18 feet high; useful inside work space is 11,000 cubic feet!

Combination gas and oil fired recirculating air system provides heating capacity to "bone" dry a 300 ton load of molds at temperatures up to 800° F. Heavy duty, sub-floor car moving system and doors at each end of oven are push button controlled.

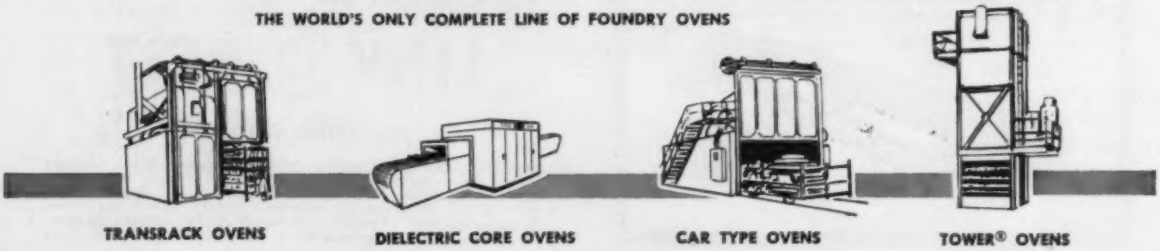
Write for Bulletin 54.



THE FOUNDRY EQUIPMENT COMPANY • **1821 COLUMBUS ROAD, CLEVELAND 13, OHIO**

World's Oldest and Largest Foundry Oven Specialists — More than half a century of specialized foundry experience.

THE WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS



TRANSRACK OVENS | **DIELECTRIC CORE OVENS** | **CAR TYPE OVENS** | **TOWER® OVENS**

For More Information Circle 585, Page 87

tape is used to seal ends to prevent fogging. Rolls of 16mm film are available on special-order basis only. —**Industrial X-ray Div., Eastman Kodak Co.**, Rochester 4, N. Y.

For More Details Circle No. 460—Page 87

TRANSDUCERS

Angle-beam transducers detect defects in metals and other hard materials even when access to only one surface is possible. Type ZSL offers transducer and wedge components which are readily interchangeable. Wedges to produce angles 45 to 90 degrees may be specified. Type ZSN will generate only one type of wave at only one angle, wedge and crystal being fixed in position. Model ZSM, 1/4 x 1/4-in. in crystal cross section, with an 8-in. flexible shielded cable between case and BNC connector, is designed for special use where contact areas or access is limited.—**Branson Instruments Inc.**, 40 Brown House Rd., Stamford, Conn.

For More Details Circle No. 461—Page 87

ROTARY COMPRESSORS

Stationary rotary compressors employing a new type of oil separator are offered in 2 to 125-hp sizes by company. An organic fiber glass element in the improved unit helps to reduce compressor oil consumption and oil content in the air produced. Oil in the air is claimed to be less than 1 oz in every 28,000 cu ft. Standard portable machines in 60 to 600-cfm capacities are available. — **Davey Compressor Co.**, Kent, Ohio.

For More Details Circle No. 462—Page 87

BLOW GUN

Industrial blow gun utilizes a pushbutton to control air delivery. In addition, an optional screw-type valve can be used to regulate the maximum volume of air which is delivered. Gun features its own hanging hook and a light, durable diecast construction. All parts are easily replaced, and the unit attaches to any standard rubber or plastic air hose. — **Foster Mfg. Co.**, Dept. IG-20, 2850 Gravois, St. Louis, Mo.

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GAS FLOW ALARM

Alarm is designed to protect against failure of gas flow to a process or heat treating furnace. It operates in conjunction with company's standard flow meter. When gas flow drops below a predetermined level, which is easily adjusted, the indicator interrupts a light beam which is focused on a photoelectric cell and an alarm is sounded or a purge system operates.

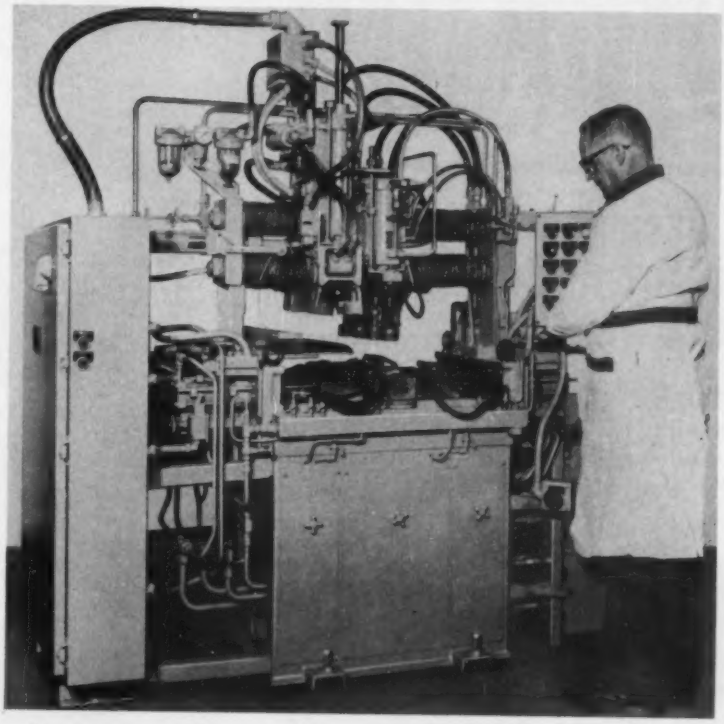
Alarm can be adapted to all meters ranging from 0-10 cfh through 0-30,000 cfh. Relay contacts contained in the alarm control handle 10 amp at 110 v.—**Waukee Engineering Co.**, 5150 N. 35th St., Milwaukee 9, Wis.

For More Details Circle No. 464—Page 87

BIN ACTIVATOR

Self-contained gyrating bin activator is designed to feed dry materials. Single activator influences about 400 cu ft. Component parts fit through an 18-in. manhole and can be bolted together within the storage bin. A 3/4-hp motor is sealed within an enclosure, permitting submersion of the entire unit. Little or no vibration reaches the motor because the drive is isolated from the bin activator proper. Assembly itself does not rotate, but transmits vibratory impulses into the material surrounding it. Standard unit activator weighs approxi-

Molding Machine Produces Aluminum Pistons



Permanent molding machine produces aluminum pistons up to 2 1/4 in. in diam at rates up to and exceeding 240 per hour depending on alloy used, pouring temperature, casting section, and tooling design. One operator can handle two units because all operations except pouring are automatic. The automatic cycle includes assembly and disassembly of molds and cores and transfer of completed pistons from molds to a chute or conveyor belt.

Molds and cores are air or water cooled. Controls for the unit are placed for easy operation and can be used for manual cycling. A special interlock prevents machine operation if control buttons are pressed out of sequence. Major machine movements are hydraulically actuated, and standard hydraulic and electrical components have been adapted for simplified maintenance and replacement.—**Permanent Mold Die Co.**, 2275 E. Nine Mile Rd., Warren, Mich.

For More Details Circle No. 479—Page 87

NEW OSBORN QUIKORE*

DESIGNED FOR SMOOTH, STEADY HOT BOX OPERATION

Here's the latest in *advanced* foundry equipment by Osborn . . . the new QUIKORE Hot Box Blower . . . engineered for high speed, fully automatic production . . . Furan or shell —cores or molds. Even CO_2. QUIKORE units let you take full advantage of the new quick setting mixes. You can completely automate and speed up your production . . . cut time and costs . . . increase your profits. QUIKORE units assure smooth, dependable operation. An Osborn Foundry Specialist can help you evaluate the advantages of using the right QUIKORE unit on your production line. Write for complete details. *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio. Phone ENdicott 1-1900.*

• Trademark

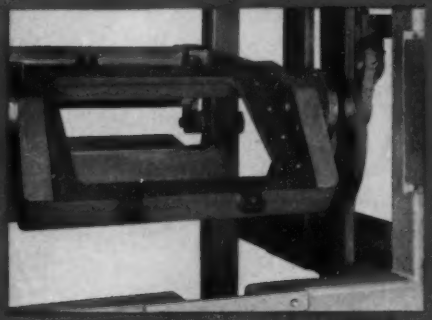
OSBORN®

FEMA

Molding Machines • Shell Core Machines • Core Blowers • Metal Finishing Machines . . . and Finishing Methods • Industrial Brushes

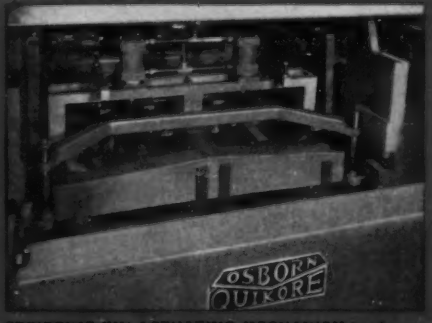
For More Information Circle 586, Page 87

PERIPHERAL TYPE GAS BURNER HEATING MANIFOLDS surround core boxes to assure fast, complete cure of sweet core.



OSBORN'S UNIQUE ROLLOVER MECHANISM is built into the machine to roll over the drag half during its descent.

*Patent Applied For



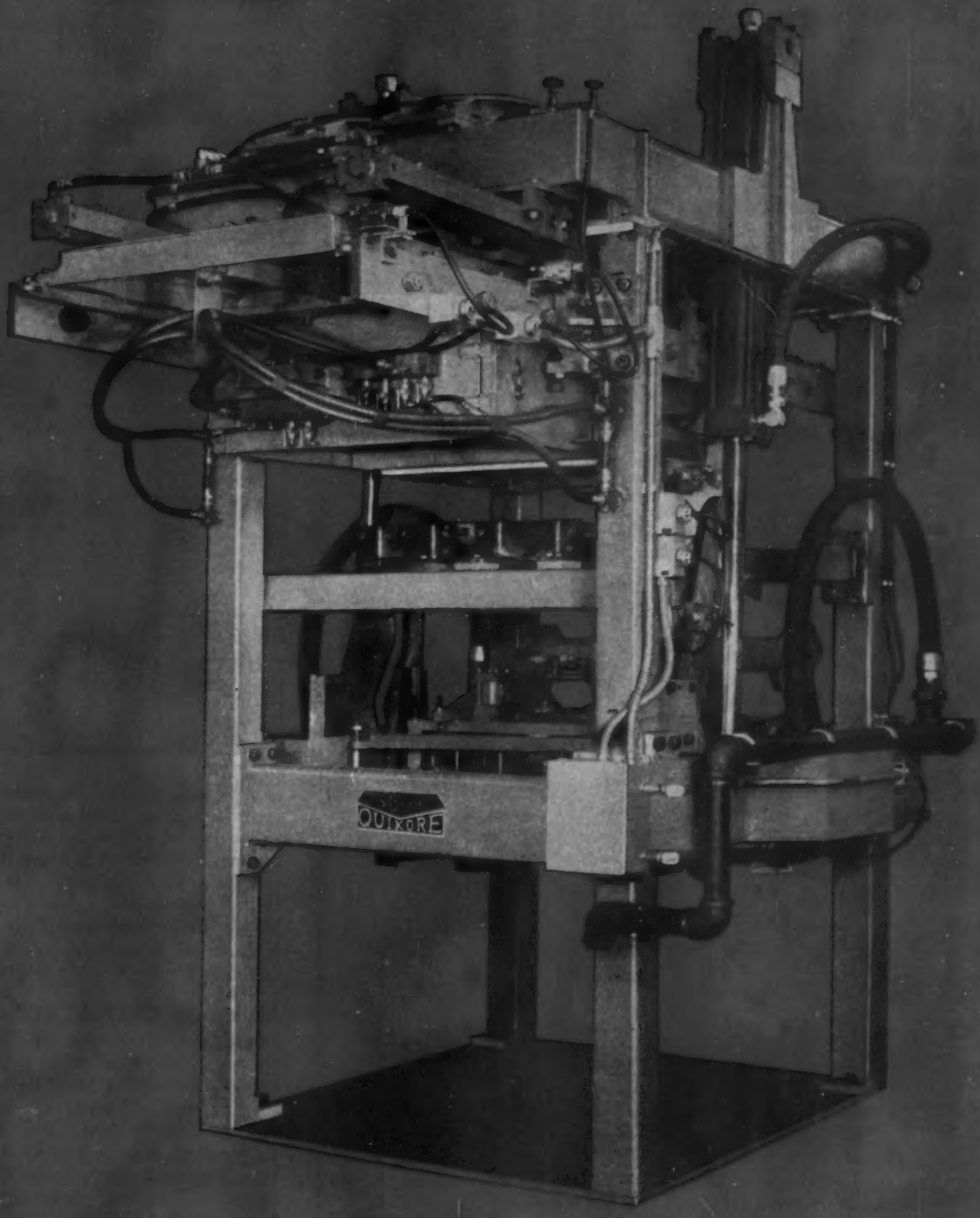
STRIPPING PIN ACTUATING MECHANISM is shown in position for automatically ejecting cores onto receiver or conveyor unit.

QUIKORE FEATURES

- Built-in rollover deposits cores on external receiver—minimizes core breakage and keeps operators out of the heat zone and blow area.
- All components are readily accessible. Rollover mechanism gives easy access to core box for cleaning and spraying.
- Sand reservoir is automatically shuttled out of heat zone during cure, prevents premature setup of mix.
- Mounted boxes assure continual perfect alignment.
- 3-inch blow valve and improved type sand reservoir give excellent blow and flow action.

OPTIONAL FEATURES

- Double-chambered sand reservoir allows blowing multiple cavities or two separate boxes.
- Stripping mechanisms for both cope and drag halves.
- Water-cooling when desired.
- Electric or gas heating for either or both halves.



OPERATING SEQUENCE:

Drag rises and engages cope, then moves up against reservoir and box is blown. Box moves down to area just above support ears for cope where final cure takes place. Meanwhile, reservoir has moved to fill position, bringing punch-out plate over cope.

Box continues downward after curing and cope is deposited on support ears. Drag moves on with core and is rolled over. At the same time, the punch-out penetrates cope blow holes and cleans them while assuring core or mold has stayed in drag.

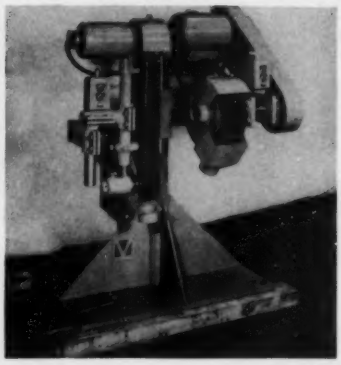
A pneumatic stripping cylinder is then energized so that when drag half starts upward, core or mold is deposited on a receiver. This prevents crushing core against receiver. Machine is now ready for another cycle. Elapsed time: approximately 15-20 seconds, depending on cure time required.

mately 200 lb.—**Vibra Screw Feeders Inc.**, 156 Huron Ave., Clifton, N. J.

For More Details Circle No. 465—Page 87

FINISHING MACHINE

Machine is designed for multipurpose operation and features a 2-hp abrasive belt grinder with contact wheel and platen for quick stock removal and a brush-backed polishing head for smoothing and blending to proper finish. Universal adjustment of the belt unit permits tilting to grind on the contact wheel. Variable speed drive on the polishing head is provided to accommodate various types of material. Independent motors allow cutout of



either unit when not in use, and both units are equipped with collection hoods.—**Grinding & Polishing Machinery Corp.**, 2530 Winthrop Ave., Indianapolis 5, Ind.

For More Details Circle No. 466—Page 87

PORTABLE HEATER

Portable radiant gas heater is available in 50,000 and 100,000 Btu sizes and will operate on all gases. Stainless steel heat exchanger glows red hot during operation and gives off radiant heat. Unit features cast iron burner, wire safety guard, and automatic safety shutoff valve. The larger unit is 36 in. high and 18 in. in diam. It weighs 50 lb.—**Space-Ray Corp.**, P. O. Box 3485, Charlotte, N. C.

For More Details Circle No. 467—Page 87

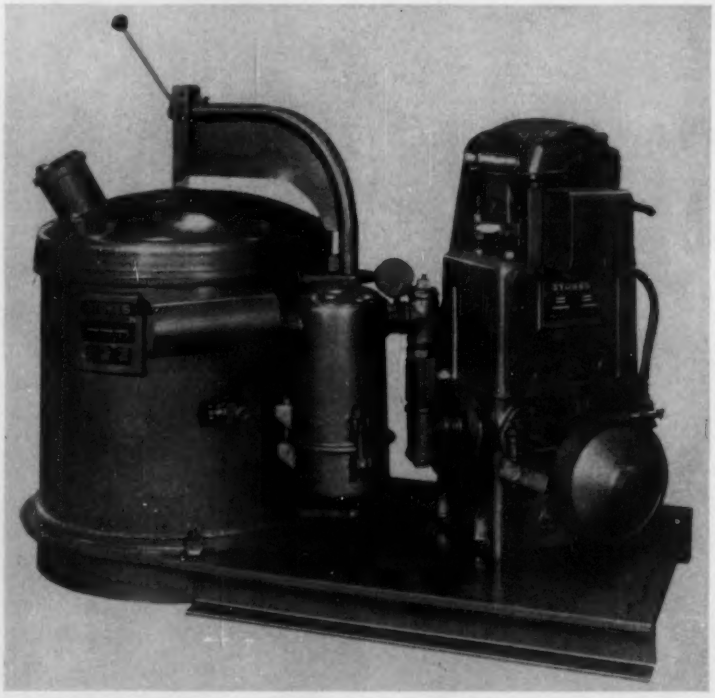
PROTECTIVE HEADPIECE

Bump cap is a lightweight, resilient, chemically resistant protective headpiece designed for use in areas without danger of falling objects. It weighs less than 7 oz, has

a 2-in. square space for company insignia, and is available in standard colors of white or yellow or in special colors on request. It is equipped with removable, adjustable suspension and a chin strap.—**Mine Safety Appliances Co.**, 201 N. Braddock Ave., Pittsburgh 8, Pa.

For More Details Circle No. 468—Page 87

Vacuum Unit Degasses Molten Casting Metal



Vacuum degassing unit can accommodate crucibles up to size 150. It features a vacuum chamber with a cover that swings on its own jib crane and a pumping system that creates sufficient vacuum quickly enough to remove most gases from the melt in 5 to 10 minutes. Both components are mounted on the same base plate, and the chamber can be removed quickly from the base to clean up spilled metal when it occurs.

A glass window in the chamber cover permits observation of the degassing and can be replaced easily if necessary. An air filter is provided on the pumping system to protect it. The complete unit is about 3 ft wide by 6 ft long.—**F. J. Stokes Corp.**, 5500 Tabor Rd., Philadelphia 20, Pa.

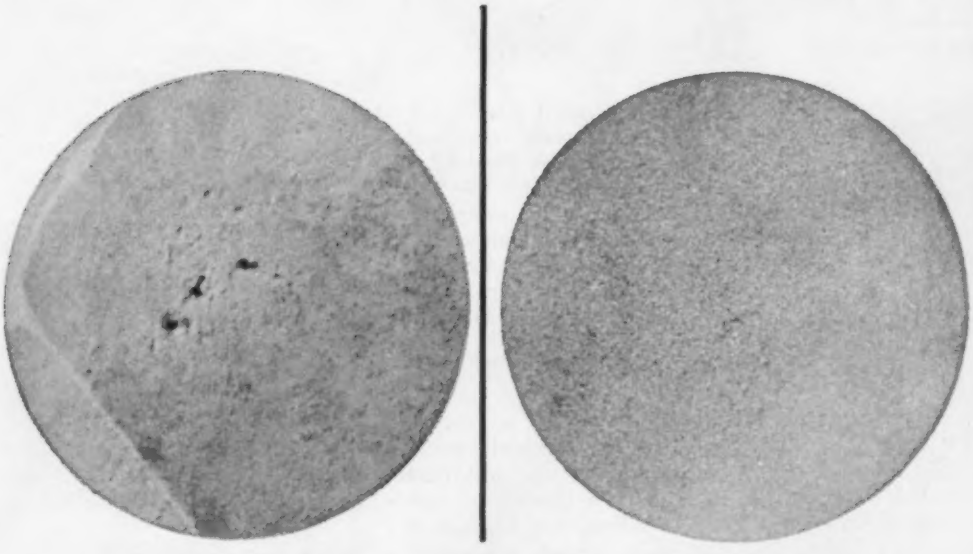
For More Details Circle No. 480—Page 87

ALUMINUM BRAZING ROD

Eco-bond 61 is said to permit metallic bonding of aluminum to itself without fluxes. To perform the bonding, the two pieces of aluminum are heated until they melt the bonding alloy (at about 717° F) as it is rubbed on the joint. If the aluminum has been anodized, alodized, or alumilited, the protective coating is ground off the joint area and the standard procedure is followed. Any heating method can be used, but torch heating is recommended because of its speed. When the alloy is properly applied, parent metals will fail before the bond. Transition joints between aluminum and copper or stainless steel also may be bonded with the rod, but

CONTROL CASTING SHRINKAGE, REDUCE REJECTS, LOWER COSTS WITH

Federated PT-processed aluminum alloy ingot



Sand casting at left shows typical surface shrinkage. Sand casting at right, produced under same casting conditions, was made from Federated PT Grade ingot.

For consistent, effective control of a common aluminum casting problem — solidification shrinkage — use Federated's PT processed alloy ingot. Here are its unmatched advantages:

- *Improved pressure tightness*
- *Decreased shrinkage*
- *Minimum shrinkage variation*
- *Shrinkage extremes eliminated*
- *Smoother, brighter surfaces*
- *Fewer rejects*
- *Simpler gating*
- *Lower casting costs*
- *Reduced impregnation cost*
- *More consistent foundry performance*
- *Higher yield per pound of metal poured*

The PT process does not affect physical and mechanical properties, machinability, finishing or heat treating characteristics of Federated aluminum casting alloys.

For more detailed information, write for a copy of Bulletin 200 to: Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, N. Y.

*Pressure-tight, shrink resistant

PT* CASTING ALUMINUM

ASARCO

For More Information Circle 587, Page 87

a low zinc chloride flux is suggested.—**Paraco Metals Inc.**, 45-02 83rd St., Elmhurst 73, N. Y.

For More Details Circle No. 469—Page 87

AIR VALVES

Air valves feature ⅛ NPT air connections and three or four-way operation. The three-way valve is designed to be used with a single acting air cylinder and the four-way valve with a double-acting air cylinder. Each valve is base mounted

and is 1 13/16 in. high. All working parts can be replaced without removing the valve from a line.—**Bimba Mfg. Co.**, 101 Main St., Monee, Ill.

For More Details Circle No. 470—Page 87

ALL-PURPOSE HOOK

All-purpose hook is designed so that the operator can release a load

while standing clear. A positive lock prevents opening under any load conditions except when the load is released intentionally by the pull ring. The hook will fit practically any type of fitting, is lightweight, has a wide opening for its size, and has a high strength-to-weight ratio. —**Merrill Bros.**, Artic St., Maspeth, N. Y.

For More Details Circle No. 471—Page 87

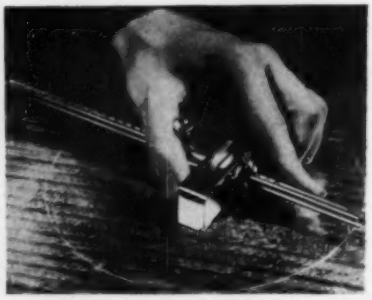
CUTOFF WHEELS

Reinforced cutoff wheels in 12 sizes of 24-grit are available from manufacturer for production testing. Also offered are 10 sizes of nonreinforced wheels in several grits. Reinforced types are designed for deep cuts or where side pressure is a factor. Nonreinforced types are designed for short cuts and where setups are sufficiently rigid to minimize side pressure. A special ingredient is said to promote longer wheel life by producing freer cutting, less burning, and freedom from burrs.—**Peninsular Grinding Wheel Co.**, 729 Meldrum Ave., Detroit 7, Mich.

For More Details Circle No. 472—Page 87

LAYOUT TOOL

Layout tool is useful to patternmakers for scribing straight lines or circles to plus or minus 0.005 in. A ¼-in. adjustment on the locating rod provides the coarse setting, and a wheel adjustment, one revolution of which equals 1/16-in. travel, gives the fine setting. Once the final setting has been estab-



lished, a lever lock holds it until released. Separate graduations are provided for circles and for straight-line work. The trammel point is located at the back of the headstock, and either carbide tips for metal work or leads for wood or plastics may be used. Sizes available are 12, 18, and 24 in.—**O'Brien Engineering Co., Mfg. Div.**, South Beloit, Ill.

For More Details Circle No. 473—Page 87

WINCH

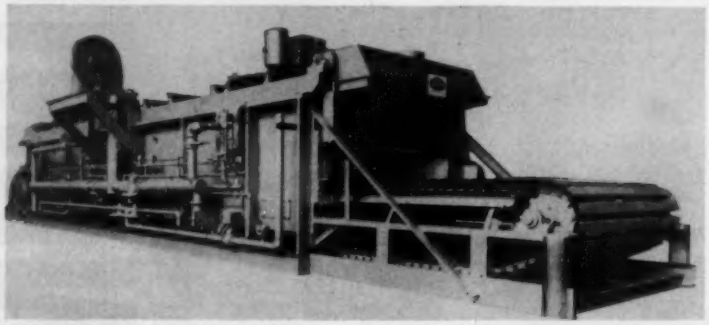
Worm gear winch has pulling capacity of 2500 lb with a 25-to-1 ratio provided by a steel cut gear and a hardened steel cut worm. It holds the load in any position without a brake. Approximate drum capacity is 250 ft of 3/16 in. cable, 120 ft of ¼ in. cable, and 45 ft of ⅜ in. cable. Of all-steel construction it can be adjusted for vertical or horizontal mounting. Unit can be used as a hand winch (handle length is adjustable) or with an electric motor.—**Hawkeye Industries**, 98 S. Main St., Longmont, Colo.

For More Details Circle No. 474—Page 87

VIBRATORY FEEDERS

Vibratory feeders in adjustable or fixed-rate models are capable of

Furnace Draws Ferrous and Nonferrous Metals



Furnace is to be used for continuous drawing of ferrous and nonferrous metals. It is built in nine sizes with heating chamber dimensions ranging from 1 ft 4 in. wide by 8 in. high by 6 ft long to 3 ft 6 in. wide by 8 in. high by 16 ft long. Production ranges from 100 to 1000 lb per hour. A maximum temperature of 1250° F is provided by either gas firing or electrical heating, as desired by the customer. — **Sunbeam Equipment Corp.**, Meadville, Pa.

For More Details Circle No. 481—Page 87

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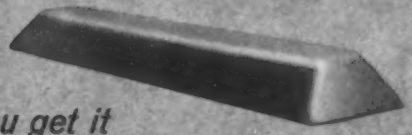
perfect

CONTROL...



you get it

with **MELTRITE**

Controlled Cupola Charge* is a certainty when you use Interlake's famous Meltrite pig + steel + your own returns. YOU GAIN: (1) Shippable castings at lower cost. (2) Greater customer satisfaction.

*** CCC**

Wherever you are, a PM & Company Metallurgist is ready to talk with you about Controlled Cupola Charge and Meltrite—the 100% merchant pig iron that's always in dependable supply.

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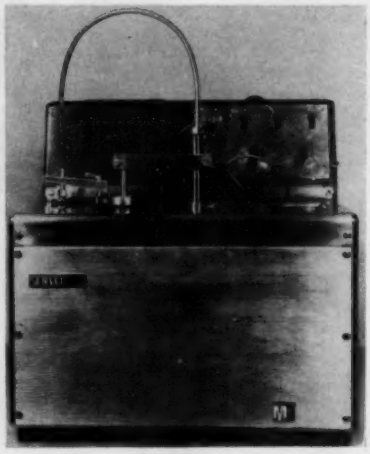
handling up to 750 tons per hour. Units can be used singly or in combination for accurate control of process operations. A standard, fully enclosed 900-rpm motor with small counterweights provides an exciting force that is amplified through resonance action of heavy duty shear springs to develop vibration. Adjustable-rate models utilize air springs to vary the stroke and feed rate.—**General Kinematics Corp.**, 132 W. Northwest Highway, Barrington, Ill.

For More Details Circle No. 475—Page 87

ELECTRIC METAL CUTTER

Servomet is a machine that cuts metal by means of an electric spark, producing a smooth, strain-free surface. It is useful in preparation of



thin wafers for subsequent electrolytic thinning, transmission microscopy, and the preparation of difficult metallographic specimens.—**Jarrell-Ash Co.**, 26 Farwell St., Newtonville 60, Mass.

For More Details Circle No. 476—Page 87

VIBRATION ISOLATION PADS

Fiberglass vibration isolation pads can be used to isolate vibration and eliminate lagging machinery to the floor. Savings in installation and relocation result from the elimination of lag screws and special foundations. High density fiberglass utilizes elasticity of the glass fibers to give good isolation efficiency plus high internal damping. Pads are furnished in 18 x 18 x ½-in. sheets prescored at 2-in. intervals for fast, easy cutting.—**Consolidated Kinetics Corp.**, 1065 Dublin Rd., Columbus 12, Ohio.

For More Details Circle No. 477—Page 87

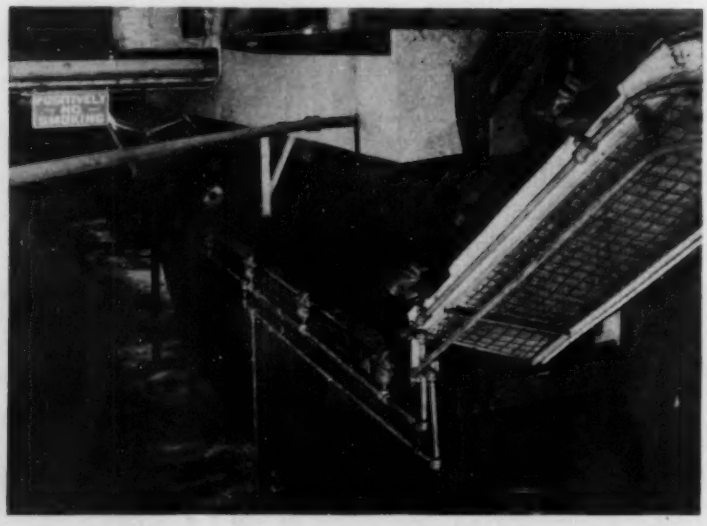
Polymer Rust Inhibitor Solves Coating Problems

● A COATING MATERIAL which not only inhibits corrosion, but also serves as a primer coating for paint is used on certain castings by Kuhns Bros. Co., Dayton, Ohio. Because it is a clear synthetic polymer, castings can be inspected after they are coated, and it can be applied by a number of methods.

Kuhns Bros. makes gray and ductile iron pipe fittings from ¼ up to 12-in. sizes. With some of these fittings, the company had trouble with the various coatings used. Customers sometimes wanted, for example, to use special paints that would not adhere to the standard coatings. Special handling with sand or shot blasting then was required to clean the fittings before painting since the castings rusted if they were shipped with no protective coating.

A rust inhibitor produced by Surface Research Corp., Columbus, Ohio, turned out to be the answer. This material, called BC-32S, eliminated the need to remove the protective coating because it serves as a primer coating. It is said to promote paint adhesion and prevent underfilm corrosion. Also, it withstands heat at temperatures up to 500° F for short periods without damage to the film.

This overhead conveyor carries castings into the dip tank of a clear rust inhibitor. The coating also serves as a primer for painting



The coating is applied at Kuhns Bros. by dipping the castings in the inhibitor. An overhead conveyor carries the castings into a large dip tank which holds about 750 gal of the material. The thin layer of inhibitor covering each casting is between 0.1 and 0.17 mil thick and dries in about 15 min. A gallon covers up to 2500 sq ft.

In addition to dipping, the coating can be applied by spraying or flow coating and will adhere to aluminum and other nonferrous metals as well as to ferrous materials. A coating protects a casting for at least 30 days or up to six months, depending on application method and storage conditions.

The customer can inspect the coated castings when he receives them because the coating is clear. If inspection is not required and color is desirable, pigment can be added to the inhibitor.

For More Details Circle No. 482—Page 87

The first HANDY SANDY, installed at Michigan Wheel Company in 1950.

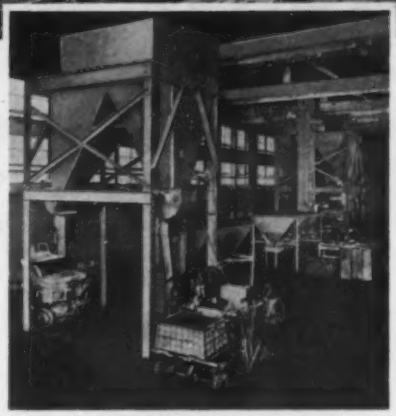
Today's modern foundry at Michigan Wheel Company, automated with six double HANDY SANDY units, and six REDDY SANDY units.

Michigan Wheel Company of Grand Rapids, Michigan, replaced hand shoveling with the first HANDY SANDY built in 1950, for casting boat propellers. Before installing the HANDY SANDY, one molder shoveling produced 50 to 55 molds per day. With the HANDY SANDY the same molder turned out 90 to 100 molds per day, and "still felt like working another shift."

Today, Michigan Wheel Company has the installation of six double units of HANDY SANDYS, shown above, which parallels the growth of this company's foundry operations since 1950, and this growth has led to the entirely new foundry.

Further Proof of Newaygo's Leadership in "packaged" Sand Handling Units.

Low capital investment for HANDY SANDYS permits progressive foundry mechanization—*and* savings with each unit help pay for additional units!



Cadey Aluminum Foundry Company of Grand Rapids, Michigan, invested in these two EHS Model HANDY SANDYS in 1960, to automate the production of heavy duty, high quality aluminum castings. These "big brothers of the HS Model" handle up to 20 tons of sand capacity per hour per unit.

The EHS Model HANDY SANDY has 8-inch by 5-inch cast buckets; 10-inch wide rubber-covered elevator belt; cast head and tail pulleys; heavy duty antifriction bearings throughout; cutting blade type of aerator with separate motor drive.

Performance and durability are built into every piece of Newaygo equipment. Write, phone or wire for a Newaygo Representative to help you.

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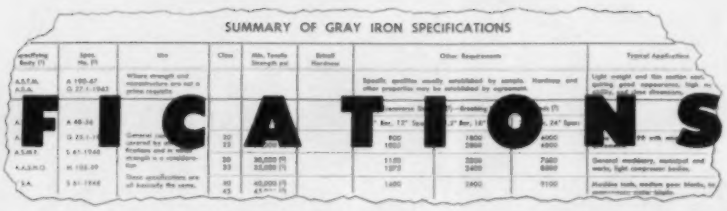
NEWAYGO engineering company
NEWAYGO, MICHIGAN

SAND HANDLING AND CONDITIONING EQUIPMENT

For More Information Circle 589, Page 87

EFFECT OF SPECIFICATIONS On Gray Iron Castings


SUMMARY OF GRAY IRON SPECIFICATIONS

By L. J. WOEHLKE
Assistant Vice President
Grede Foundries Inc.
Milwaukee

Ability to meet stricter specifications and produce better castings will assure foundries a broader position in our industrial economy, the author maintains. But if foundries fail to meet the engineers' demands, someone else will meet them and foundries will lose business by default

● CASTING QUALITY has been improved in recent years because of the foundry industry's desire to produce a better product and because of customers' tighter specifications.

The purchase of castings on specification has opened a new field of competition for foundries. Better foundries accept this new challenge as an opportunity to prove the superiority of their product over that of competitors. The foundry that ignores the new demands will soon be out of business.

Changes Made — Let's look at some of the changes that have been made in recent years to improve casting quality. Raw materials are carefully selected and inspected. Controls are applied to all steps in the manufacturing process from the molding floor to the cleaning room. Castings are given extra inspections. Supervision is increased. Operating and quality control records are maintained and evaluated.

Surface finish has been improved by molding and core sand control and better coremaking, molding, and cleaning techniques. Sand rarely is used as it comes from the pit. We demand controlled moisture, clay content, grain size, and shape. This often requires blending of several sands to get desired properties. Controlling the incoming sand has allowed us to develop various sand mixes for both cores and molds to improve surface finish.

Where mold and core washes are required, they are maintained at a definite specific gravity for each material. At Grede we check the Baume of all washes at regular intervals and post results on quality control charts at the operator's work station.

Shell cores and shell molds provide outstanding surface finish. However, most shell casting producers soon learned that their shot blasting equipment ruined the beautiful as-cast shell finish. Experiments with shot and grit sizes and various blasting materials have provided methods for maintaining the original as-cast finish.

Closer dimensional tolerances now are demanded by most casting users, principally because automation has eliminated the machinist who juggled the shifted or swelled casting to make it clean up. Machine shop cost reduction programs have demanded reduced finish stock. This situation frequently has resulted in increasing the foundry scrap because of slightly sagged cores, mold crushes, shifts, and sand inclusions. The defect that machined out with heavy stock now results in a scrap casting and a financial loss to both the foundry and the customer.

Many casting producers concern themselves only with the casting loss and overlook the numerous cost reduction possibilities for the customer in his machining stock reduction program. Tool life and machining time are major savings, but there also are such considerations as raw casting freight, machining chips removal, and low resale value of the chips.

Tighter Tolerances — Closer dimensional tolerances are necessary to meet the demand for thin-wall iron castings to compete in weight with other types of parts. The Gray Iron Research Institute recognized this demand and has initiated a project for the development of thin-wall iron castings.

To meet the challenge of tolerances specified today, additional controls, added operations, and improved methods are necessary. In the "good old days" clay, oil, and water additions frequently varied with the number of dents in the measuring can. Today, dry addi-

This paper was presented at a meeting of the Gray Iron Research Institute in Cleveland, Feb. 23.

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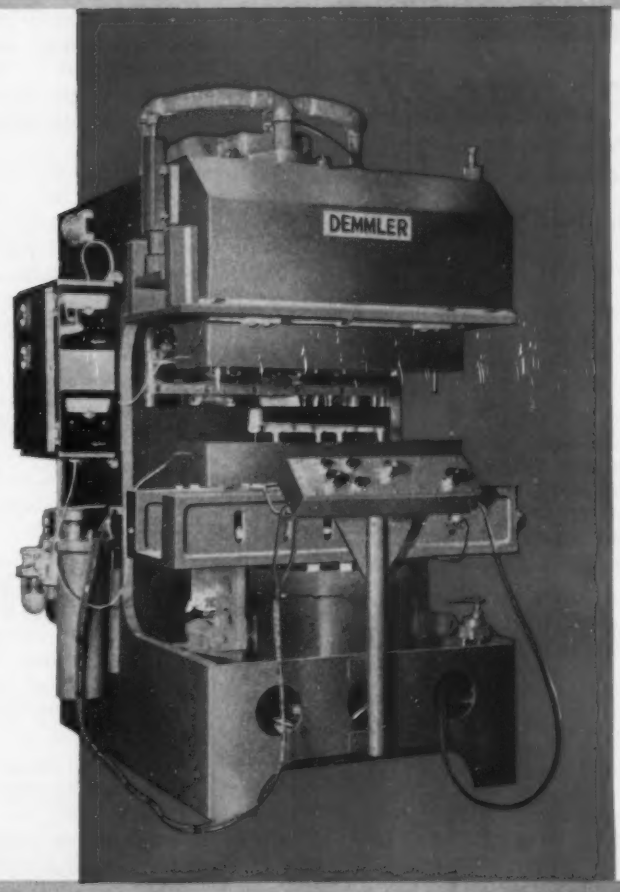

Typical cores produced by DEMMLER Edge-Blow machine:

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For More Information Circle 591, Page 87

tions are weighed and all liquids are metered. Mullers have automatic timers to aid in the control of the sand properties which affect dimensions of cores, molds, and ultimately castings.

The old-time molding foreman controlled sand properties by the "feel" of the sand, and he made on-the-spot changes in additions to get the "feel" he wanted. Today, sand properties normally are determined by the operating man and the technician working together on sand specifications that have been established on a sound technical basis. Higher standards and more sand controls are necessary as we maintain closer dimensional tolerances.

Higher Pressure—We have seen squeezer cylinders increased from 8 in. to 14 in. in diameter to produce conventional matchplate squeezer molds. This results in a 300 per cent increase in pressure exerted on the sand during the molding operation.

Cope and drag patterns designed for 19-in. squeeze machines are being used on 22-in. machines and are being considered for high-pressure molding on 30-in.-diam squeezers, rubber bladder, or multiple head hydraulic high - pressure squeeze machines.

In addition to the trend toward higher pressure green sand molding, we have the techniques of shell, furfural, CO_2 and cold setting binder cores, as well as shell and CO_2 molds for extreme dimensional control.

A factor which must always be kept in mind is that better foundry methods and operating controls can produce castings no better than the pattern equipment used. Foundries must demand good pattern equipment from customers who require close dimensional tolerances. Core pasting, rubbing, or grinding fixtures and core setting gages with machined patterns may be necessary where wood pattern equipment was acceptable for old dimensional standards. The newer binders all improve casting dimensions by eliminating sagged cores, but they also require new, high standards for corebox and pattern equipment.

The rigid cores and molds produced with these processes generally require reworking of draft angles and core prints. This need for reworking conventional equipment emphasizes the inaccuracies inherent in the old processes. Crush strips, core rubbing, and core setting fixtures are all crutches for routine production, but they cannot guarantee the accuracy of a mold or core which is "set up" while on the pattern or in the corebox.

Inspection Requirements — Dimensional requirements have increased inspection department responsibility and equipment requirements. More "GO-NO-GO" gages and jigs are being used. Casting locating points are being milled or ground by foundries according to finish line targets. At Grede Foundries, we produce many hydraulic valve bodies which, because of their intricate cores and sand-free surface requirements, are individually inspected internally with dental mirrors.

Casting layout responsibility is being shifted from the buyer's receiving inspection department to the foundry inspection department. I am sure no old-time foundryman would have believed the day would come when routine checks on castings by foundry inspectors would include use of magnetic particle inspection equipment, dial indicator calipers calibrated to thousandths of an inch, or ultrasonic testing equipment to nondestructively measure walls on water-jacketed castings. He would have thought an x-ray, gamma-ray inspection or microstructure specification for gray iron was ridiculous. We all know these new tools are not only available but are necessary to produce castings to meet today's specification requirements.

Coding Test Bars and Castings — Specifications for mechanical properties of metals have been tightened by the engineer's demands for consistent properties to enable him to reduce the safety factor required in designing. The more rigid specifications require that the foundry provide in its operations for coding of test bars and castings to guarantee that specific lots of castings have the properties demanded by the engineer.

Coding sounds like a simple addition to our regular methods. I wonder, however, if the buyer with this specification always realizes what added operations are neces-

sary. Besides the actual changing of code numbers on the pattern and test bar, the foundry must co-ordinate the coremaking, molding, and melting operations to see that the correct ladle of metal is used for specific molds. The cleaning department must keep these lots of castings together through its operations. This is especially true if heat treatment is required, since the test bar should get the same heat treatment as the castings. We have found it necessary to add storage space to our shipping departments to accommodate the accumulation of casting lots while waiting for physical, chemical, and microstructure analysis of test bars.

Certification by foundries of compliance with specifications has made this expensive segregation of lots an absolute necessity. Microstructure specifications are being applied to cast-on lugs as well as critical sections of castings. Again, coding and segregation are necessary.

Hardness Testing—Because automation demands a narrower hardness range in castings, many specifications now require 100 per cent Brinell hardness testing. To meet these specifications, foundries are purchasing automatic hardness testing equipment for routine testing inspection, and equipment manufacturers are working on the development of practical direct reading machines.

Improved casting quality to meet more rigid customer specifications requires improved techniques and added controls. Better foundries can and are meeting the demands placed before them, but it is their responsibility to inform the customers of the added costs involved. Because the tighter specifications result in higher costs, we should be sure these specifications are applied only where necessary; this requires good liaison between engineers, purchasing departments and the producing foundry.

Meet Specs or Else—In the long run, it is the ability to meet these specifications and produce better castings that will preserve our present markets and assure our foundry industry a broader position in our industrial economy. We can be sure that our competitors—the forgers, welders, pressed metal producers, etc.—are studying this subject of quality and specifications. If we fail to meet the engineers' demands, someone else will meet them and we will lose business by default.

Gray Iron Founders' Society Publishes 1961 Buyers Guide

An alphabetical list of member foundries, including data on personnel, monthly production, size, type and use of castings, foundry classifications, type of iron produced, and specific facilities, makes up the 1961 Buyers Guide and Directory of members of the Gray Iron Founders' Society. A geographical listing of society members by states and cities and a list of foundries under products manufactured complete the guide.

Single copies are available to castings buyers on letterhead requests addressed to Gray Iron Founders' Society Inc., National City-E. 6th Bldg., Cleveland 14, Ohio.

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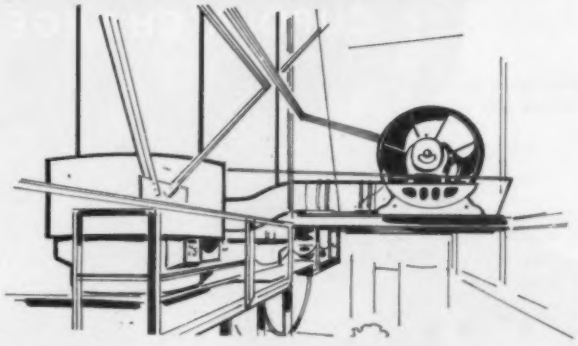

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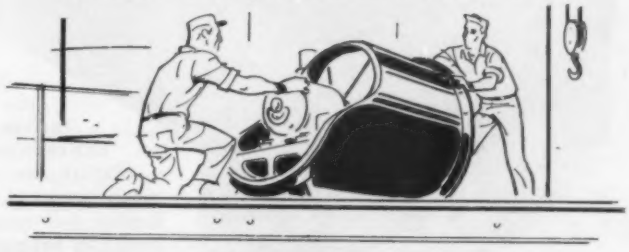

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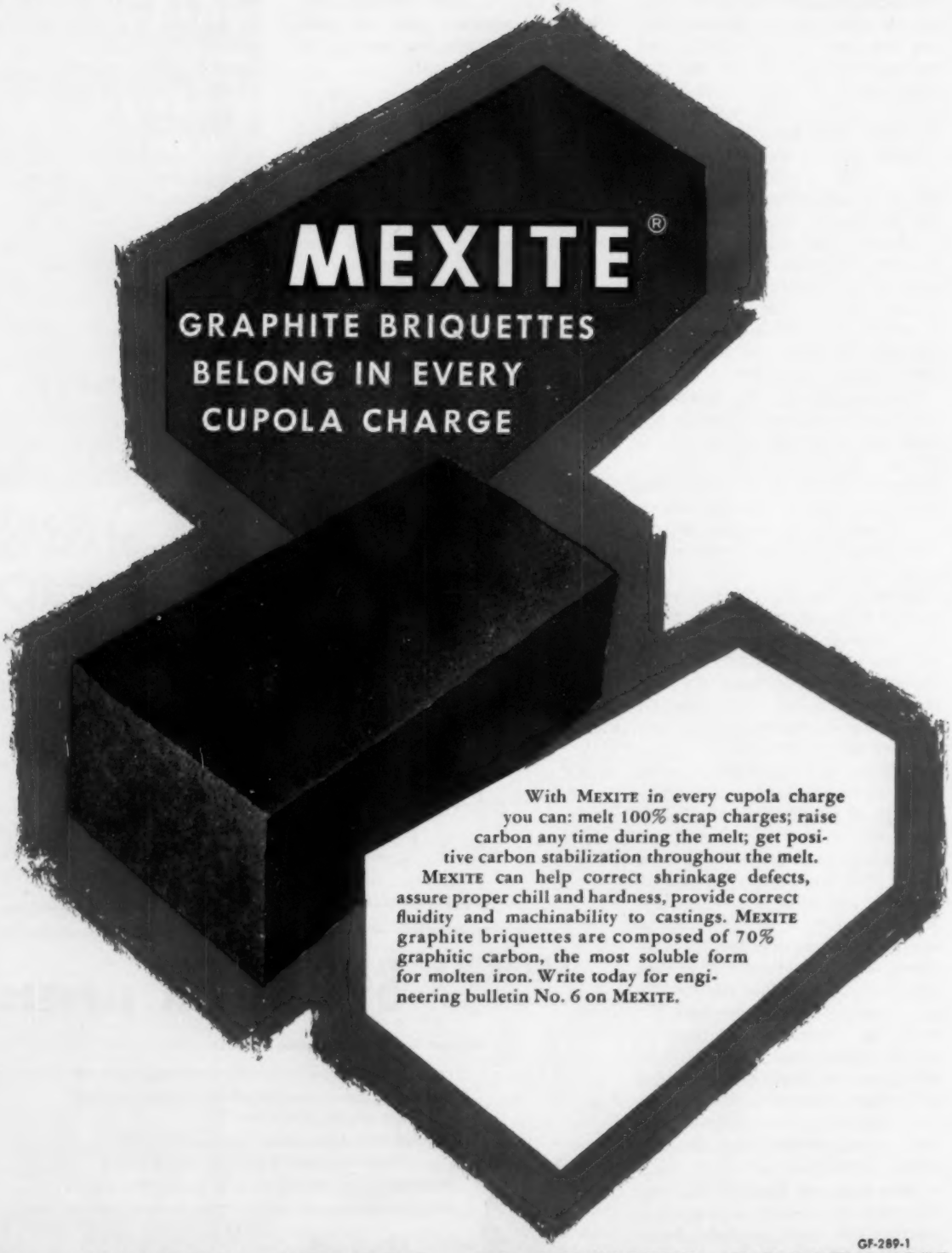
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FOUNDRY
Reader Information Service

Advertising content is classified by subject and listed by page number for your convenience when studying specific foundry applications. For further information on subjects advertised, refer to advertisement on the page indicated and circle Item Number on Reader Service Card —Page 87.

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419	449	479	509	539	569	599	629	659	689	719	749	779	809	839	869
420	450	480	510	540	570	600	630	660	690	720	750	780	810	840	870
421	451	481	511	541	571	601	631	661	691	721	751	781	811	841	871
422	452	482	512	542	572	602	632	662	692	722	752	782	812	842	872
423	453	483	513	543	573	603	633	663	693	723	753	783	813	843	873
424	454	484	514	544	574	604	634	664	694	724	754	784	814	844	874
425	455	485	515	545	575	605	635	665	695	725	755	785	815	845	875
426	456	486	516	546	576	606	636	666	696	726	756	786	816	846	876
427	457	487	517	547	577	607	637	667	697	727	757	787	817	847	877
428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
429	459	489	519	549	579	609	639	669	699	729	759	789	819	849	879
430	460	490	520	550	580	610	640	670	700	730	760	790	820	850	880

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FOUNDRY

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402 432 462 492 522 552 582 612 642 672 702 732 762 792 822 852
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404 434 464 494 524 554 584 614 644 674 704 734 764 794 824 854
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407 437 467 497 527 557 587 617 647 677 707 737 767 797 827 857
408 438 468 498 528 558 588 618 648 678 708 738 768 798 828 858
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412 442 472 502 532 562 592 622 652 682 712 742 772 802 832 862
413 443 473 503 533 563 593 623 653 683 713 743 773 803 833 863
414 444 474 504 534 564 594 624 654 684 714 744 774 804 834 864
415 445 475 505 535 565 595 625 655 685 715 745 775 805 835 865
416 446 476 506 536 566 596 626 656 686 716 746 776 806 836 866
417 447 477 507 537 567 597 627 657 687 717 747 777 807 837 867
418 448 478 508 538 568 598 628 658 688 718 748 778 808 838 868
419 449 479 509 539 569 599 629 659 689 719 749 779 809 839 869
420 450 480 510 540 570 600 630 660 690 720 750 780 810 840 870
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425 455 485 515 545 575 605 635 665 695 725 755 785 815 845 875
426 456 486 516 546 576 606 636 666 696 726 756 786 816 846 876
427 457 487 517 547 577 607 637 667 697 727 757 787 817 847 877
428 458 488 518 548 578 608 638 668 698 728 758 788 818 848 878
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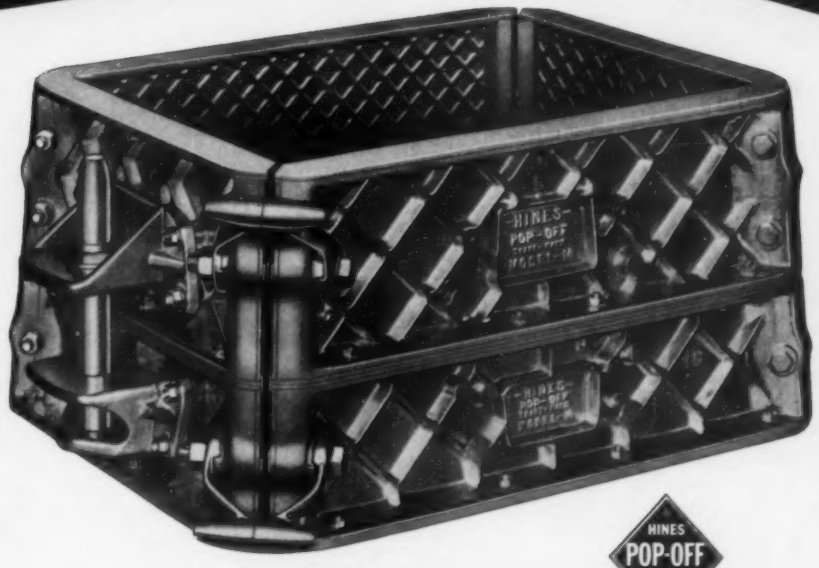
IF IT'S A "POP-OFF"... IT'S HINES!



HINES
POP-OFF
FLASK

HINES "POP-OFF" flasks have always contributed to better foundry production. The "POP-OFF" feature, a comparatively simple, but highly efficient and dependable method of opening flask corners, for easy flask removal, has often meant the difference between perfect molds and scrap.

IF IT'S HINES... IT'S THE BEST!

The
HINES FLASK CO.
3431 WEST 140th STREET
CLEVELAND 11, OHIO
ORchard 1-2806

FEMA

HINES FLASKS

MANUFACTURERS OF
"POP-OFF", "HINGE-OFF", Slip and Tight Flasks, Upset Frames, Aluminum, Iron and "HI-FLEX" Jackets, Pins, Bushings, Guides, Bottom Boards

For More Information Circle 594, Page 87

INDUSTRY BRIEFS

National Malleable & Steel Castings Co., 10600 Quincy Ave., Cleveland, Ohio, has changed its name to National Castings Co. National operates 12 plants and is one of the country's leading independent foundries.

Duplex Mfg. & Foundry Co., Elyria, Ohio, suffered a fire July 8 with damages estimated to be as much as $\$1/2$ million. The blaze destroyed the foundry's pattern storage building and also damaged three homes severely. The plant was closed for a two-week vacation period at the time of the fire.

Rudisill Foundry Co., Anniston, Ala., has closed down operations and will not reopen. The company manufactured cast iron soil pipe and fittings.

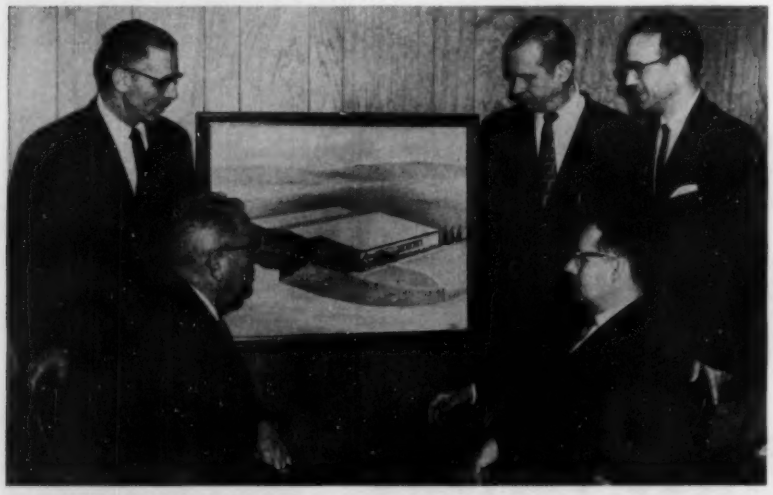
Griffin Wheel Co., subsidiary of American Steel Foundries, Chicago, will have a capacity of 48,000 tons of steel wheels per year at its new plant at Bensenville, Ill. Last month a figure of 48,000 wheels per year was reported incorrectly.

Riverside Iron Works, 10640 S. Buffalo Ave., Chicago, Ill., closed June 12. The property has been sold, and foundry operations will not be resumed by the new owner.

Central Foundry Co., Newark, N. J., manufacturer of cast iron soil pipe and fittings, has formed a new corporation which will build a 1000-home community called Future Haven near Washington, D. C.

G. E. Smith Inc., Pittsburgh, has signed a licensing agreement with Gebr. Huttens KF., Dusseldorf, Germany, which permits the German firm to manufacture Smith's binders in Germany.

Penn-Rillton Co. near Irwin, Pa., suffered damages estimated at $400,000 as the result of a coal dust explosion and fire on June 23. The company produces seacoal and other materials used in the manufacture of castings.



NEW BUILDING STARTED: Executives of Arcair Co., Lancaster, Ohio, examine an artist's sketch of the new plant being built by the company. Left to right, seated, are E. J. Lehmkuhl, sales manager, and M. D. Stepath, president. Standing are W. J. Coughlin, technical service manager, J. N. Gaskins, office manager, and H. R. Henderson, chief engineer. The one-story structure will triple existing facilities and will house manufacturing, warehouse, and office operations, in addition to a larger laboratory

Casting Equipment Inc., Berea, Ohio, has been appointed Ohio sales representative for Detroit Electric Furnace Div., Kuhlman Electric Co., Birmingham, Mich.

Chicago Faucet Co., Chicago, is building a new 73,000-sq-ft plant at 2100 S. Nuclear Dr., Des Plaines, Ill. To be occupied this fall, the new facility doubles present manufacturing space.

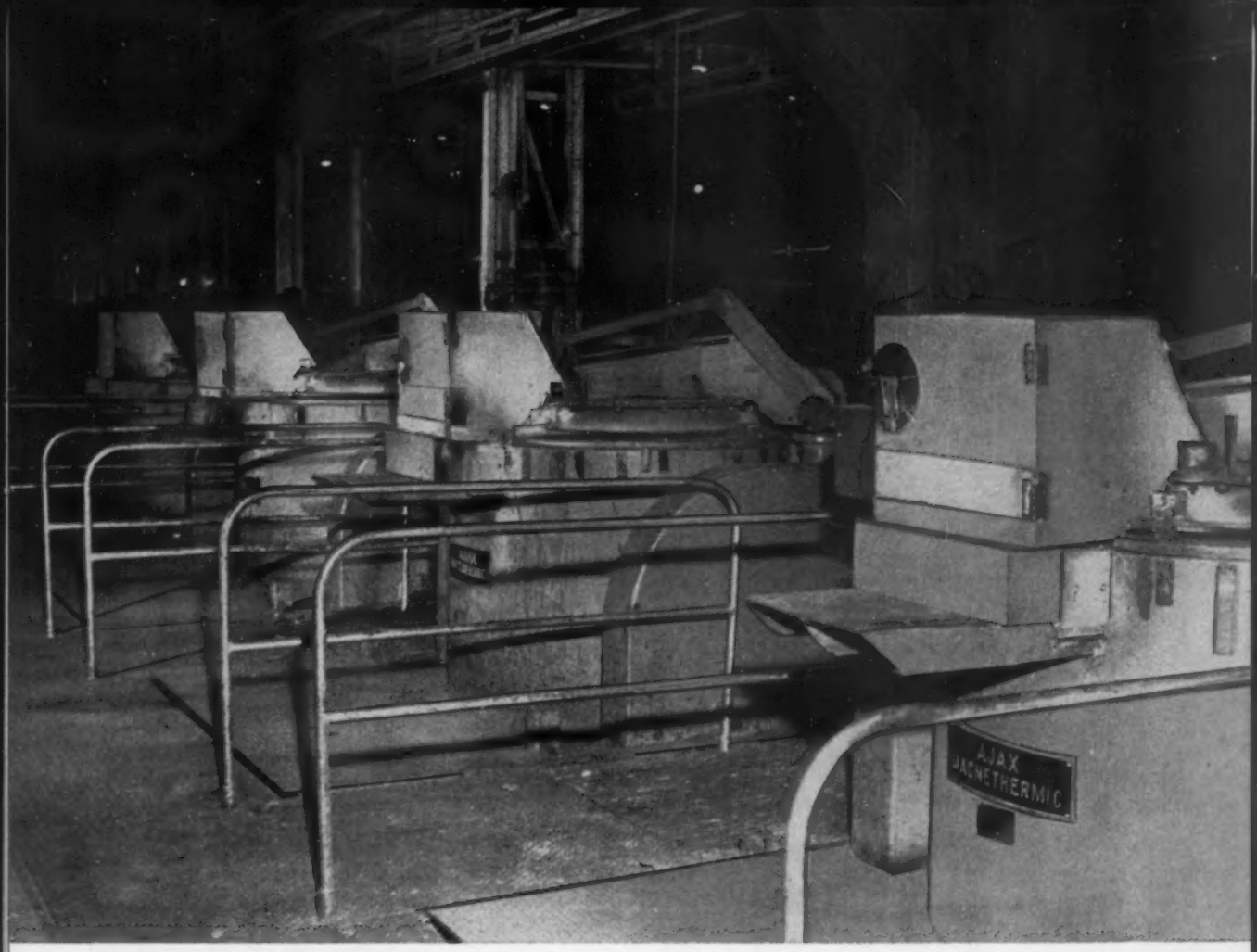
Union Steel Products Co., Albion, Mich., and **Banner Metals Inc.**, Compton, Calif., have appointed Stanley E. Morris Co., 5584 Alhambra Ave., Los Angeles 32, Calif., to be southern California representatives for the sale of their material handling products. Banner manufactures some USP equipment on the West Coast under a licensing agreement.

Ampco Metal Inc., Milwaukee, Wis., has named Knapp Foundry Inc., Guilford, Conn., and Yankee Casting Co., Hazardville, Conn., licensees to produce castings made from Ampco copper-base alloys. Knapp foundry will also continue to serve as an Ampco distributor of standard products.

C & S Products Co. Inc., affiliate of Barber-Greene, Aurora, Ill., will move all manufacturing and administrative facilities from Detroit to DeKalb, Ill., on August 15. The move will provide increased manufacturing facilities to handle the company's growing volume of business.

Benjamin Lassman & Son, Glenshaw, Pa., has formed a Western Sealant Div., which will specialize in the sealing of microporosity in metal castings.

Air Reduction Co. Inc., New York, has signed formal agreement to acquire Speer Carbon Co. The assets and business of Speer Carbon will be acquired in exchange for Air Reduction common stock at



Price Pfister Brass Mfg. Co. Melts Brass in Four AM Channel-Type Induction Furnaces

Your inquiry will be answered promptly. Outline your ideas or requirements in letter, or phone.

"We conducted an extensive investigation among users throughout the country. As a result of our findings, we decided that Ajax Magnethermic furnaces were the only ones for us.

"Four Ajax units, each melting 2400 pounds per hour, replaced 14 gas-fired furnaces. The results have been astonishing. Working conditions have improved appreciably by reduction of foundry temperature and noise level. We have saved 30% in floor space, greatly reduced maintenance and practically eliminated down time.

"Equally important . . . service. Even though we are located on the West Coast, the Ajax Magnethermic service has been second to none."

Gottlob Hinderer, Works Manager
Price Pfister Brass Mfg. Co.
Los Angeles, California

Manufacturer of plumbing faucets and gate valves

AJAX MAGNETHERMIC CORPORATION

Induction Heating is our ONLY Business

GENERAL OFFICES P.O. Box 839 • Youngstown 1, Ohio
TRENTON DIVISION 930 Lower Ferry Road • Trenton 5, New Jersey
YOUNGSTOWN DIVISION 3990 Simon Road • Youngstown 12, Ohio
AJAX MAGNETHERMIC CANADA LTD. Box 779 • Ajax, Ontario

For More Information Circle 595, Page 87

the rate of one share of Air Reduction stock for each 2.25 shares of Speer Carbon stock. The business will continue to be operated by the present management at St. Marys, Pa.

Associated Foundry Services Inc., Los Angeles, has appointed the following distributors: Snyder Foundry Supply, 2444 E. 57th, Los Angeles, for southern California, Arizona, and New Mexico; Amador Minerals, 4921 San Francisco Blvd., Sacramento, Calif., for northern California; and DeFreece Precision Casting Specialties, Bellevue, Wash., for Washington, Oregon, and British Columbia.

G. E. Smith Inc. has established a new Industrial Div. to manufacture and distribute a line of products supplementing the firm's binders and other chemicals. G. E. Smith also announces the move of its general office to 4 West Manilla Ave., Green Tree, Pa.

Brown & Perkins Inc., 675 New Brunswick Ave., Perth Amboy, N. J. has been formed to manufacture wire rope slings, fittings, and swaged assemblies for industrial and other uses. Donald W. Perkins is president and William T. Brown is vice president.

Lava Crucible-Refractories Co., Pittsburgh, has appointed Eastern Crucible-Refractories Co., Seymour, Conn., to be its exclusive sales representative for the eastern United States.

Industrial Heating Equipment Association reports that total net orders for industrial heating equipment during the first four months of 1961 were off 32 per cent from the same period last year.

Pioneer Belting & Conveyor Equipment Corp. has acquired the plant and assets of Corns Conveyor Belt Co., Griffith, Ind., and will operate Corns as a division, with the same name.

Picker X-Ray Corp. has opened new headquarters at 1275 Mamaroneck Ave., White Plains, N. Y. The new structure contains 47,000 sq ft of floor space and will house approximately 150 executives and staff personnel, a classroom for 100, employee dining room, offices, and facilities for demonstrating new apparatus.

Yale Materials Handling Div., Yale & Towne Mfg. Co., has moved its Bay area industrial lift truck and tractor shovel sales and service activities and the Western Parts Depot to 2303 Merced St., San Leandro, Calif. The $300,000 facility includes 26,000 ft of space.

A. O. Smith Corp., Milwaukee, has moved West Coast sales offices of its Welding Products Div. and Electric Motor Div. to the Pacific Bldg., 610 Sixteenth St., Oakland, Calif.

Penn Industrial Equipment Co., Lancaster, Pa., has been appointed central Pennsylvania representative for Elwell-Parker Electric Co., Cleveland. Penn Equipment specializes in sales, engineering, and service of material handling equipment.

IT SHOULDN'T be surprising to you that someone has been able (at long last) to closely control the specifications of shot and grit. And if you are willing to accept this statement as a fact—the door suddenly opens to substantial reductions in your *cleaning room costs!*

National Metal's **Permabrasive®** cleans 20% faster and costs less than steel. This can either mean a big savings in time, or a big savings in power, if you can't use more speed. Add savings in maintenance to lower costs per ton over steel abrasives and you have reduced your cleaning room costs, which are a part of the cost of your product.

You may be interested in **New Controlled "T"®**, a half a ton of which does the work of a full ton of ordinary chilled iron abrasives; or in **Perma-Steel®** that lasts as long and cleans as well as steel at a much lower cost! But one thing is sure: If you give these abrasives with controlled characteristics the controlled use they deserve, your surprise will be a pleasant one. Write for free booklet: "The Facts of Life Concerning the Use of Shot and Grit."

NATIONAL METAL ABRASIVE COMPANY
3560 NORTON ROAD • CLEVELAND 11, OHIO

Western Metal Abrasives Co. (affiliate) 101 E. Main Street, Chicago Heights, Ill.

Sold Exclusively by
HICKMAN, WILLIAMS & CO., INC.
Chicago • Detroit • St. Louis • New York
Cincinnati • Cleveland • Philadelphia
Pittsburgh • Indianapolis

Exclusive Subdistributors
BRUMLEY-DONALDSON COMPANY
Los Angeles • Oakland • Seattle
THE FOUNDRY SUPPLY CO., INC.
Minneapolis

WHEN IT COMES TO CHAPLETS AND CHILLS . . .

FANNER HAS THE GREATEST*

* GREATEST SERVICE — Through a staff of experienced sales engineers and factory "know-how".

* GREATEST LINE OF PRODUCTS — The most complete range of highest quality chaplets and chills in the world.

* GREATEST DELIVERY — From an inventory of over 100,000,000 pieces produced through specialized facilities and the latest manufacturing methods.

WHY NOT GET THE "GREATEST" — WHEN IT COSTS NO MORE?

* FANNER *Groovestem* CHAPLETS are typical of FANNER SUPERIORITY OF DESIGN

(1) Featheredge Fusion Rings, (2) Complete Contact Radius Grooves, and, (3) Countersunk Shoulders on Stem provide:

MAXIMUM FUSION
ASSURED CORE SUPPORT
FREEDOM FROM LEAKERS
ACCURATE WALL THICKNESS

Precision tolerances too — ± .002 on most sizes. Made in a wide variety of types.

the FANNER MANUFACTURING CO.

Designers and Manufacturers of Fine Fanner Chaplets and Chills

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Cleveland, Ohio
Phone: CLEVELAND — SH. 1-6000

For More Information Circle 597, Page 67

From the complete line of HARBISON-WALKER

FOUNDRY REFRACTORIES

. . . a wide selection of leading brands for each particular application

FOR CUPOLAS, (both acid and basic) Harbison-Walker provides all the different kinds of brick, castable and plastic refractories and ramming mixes. In the charging zone, H-W EXTRA STRENGTH CASTABLE makes a hard strong refractory concrete lining which is extremely resistant to impact and abrasion. In the melting zone of acid cupolas, highly siliceous H-W KUPLOMIX forms monolithic linings which are durable and readily maintained.

In basic practice, H-W MAGNEX CF (chrome free) chemically-bonded magnesite brick and the hard fired H-W MAGNESITE brick most satisfactorily fulfill the requirements for melting chromium-free metal. MAGNEX is a strong chemically-bonded magnesite-chrome refractory with which excellent records have been established in cupola linings.

H-W MAGNAMIX is a granular ramming mix of high magnesia content which is used both by itself and in mixtures with other materials of lower magnesia content to increase refractoriness and chemical resistance to highly basic slags.

FOR ELECTRIC FURNACES. Roofs — STAR, the standard of quality in conventional silica brick, and VEGA, the superduty silica refractory are widely preferred for their service records in steelmaking furnaces. Harbison-Walker superduty fireclay brick and the wide range of high-alumina brands provide for the most severe spalling conditions and highest working temperatures needed for various alloys.

Bottoms (Basic Practice)—H-W C-MIX used for contour-rammed electric furnace bottoms greatly reduces furnace downtime and avoids burning-in sacrifice of refractory construction.

Sidewalls (Basic Practice)—METALKASE brick in its several modifications is highly resistant to thermal spalling and corrosion by highly basic slags.

FOR MALLEABLE FURNACES. Among the Harbison-Walker brands noted for their splendid service in air furnace bottoms, sidewalls and bungs are ALAMO, superduty fireclay brick and ANKORITE 65 heat-setting mortar, pre-eminent in this application. Corresponding H-W brands along with high-duty fireclay and high-alumina brick made in various producing districts, afford transportation cost and delivery advantages.

FOR ALUMINUM FURNACES. Harbison-Walker has developed through sustained research and service studies several unique high-alumina refractories that are outstanding in resistance to penetration and reaction with molten aluminum and its alloys. These specialized brands—CORAL and CORAL BP along with KORUNDAL brand, long established at many primary aluminum plants, have exceptional ability to withstand severe impact and abrasion and the severe corrosive conditions of exposure in bottoms and lower sidewalls.

CORALBOND is the companion mortar developed specifically for aluminum melting furnaces. It is outstanding in resistance to penetration and corrosion by aluminum alloys.

For upper walls and roofs, ALAMO and other time-tested brands of Harbison-Walker fireclay and superduty brick are regarded as standards. A number of Harbison-Walker monolith-forming refractories—plastics and castables—are used to advantage in bottoms, sidewalls and ladles, where strength and penetration-resistance are required.

FOR FOUNDRY LADLES, which comprise many sizes and types, Harbison-Walker lining materials include the many classes of brick in the alumina-silica fireclay group, superduty fireclay and high-alumina brick, many plastic and castable refractories and ramming mixes. In addition, Harbison-Walker manufactures many standard sizes of sleeves and nozzles, noted for the best in refractoriness and excellent workmanship.

MOLDING MEDIA

CALAMO (for investment molds), one of the extensively used Harbison-Walker products for molding, is an alumina-silica refractory of optimum sizings for various molding mixtures. Its fusion point is 100°F. higher than that of normal silica sand mixes.

H-W FLINTGRAIN (for ceramic shell molds) is an alumina-silica refractory, similar in composition to CALAMO, having the same very desirable low thermal expansion characteristics, but greater angularity of grain shape.

The angular grain shape and optimum size distribution make H-W FLINTGRAIN ideal for securing maximum compactness in the mold. It is used with special benefit for making ceramic shell molds and for similar applications in which dense, compact mold section of greatest volume stability at all temperatures, are of paramount importance.

H-W MULLITE GRAINS and FLOURS (for precision molding of metals at extremely high temperatures) — These Harbison-Walker mullite products by virtue of their high-alumina composition and low content of basic oxides are very refractory. The hard dense grains are strong and most resistant to fluxing. Excellent thermal stability accounts for their unusual constancy of volume up to their very high temperature limit.

GATE and RUNNER TILE — Harbison-Walker refractory gate and runner tile, available in many sizes of splendid workmanship, withstand rapid metal flow without excessive erosion, resulting in cleaner metal and reduced scrap loss.

FOR OTHER APPLICATIONS, Harbison-Walker products include: monolithic and brick linings for annealing and heat treating furnaces; all the classes of insulating firebrick for service at various temperatures up to 3000°F; plastic graphite refractories; a complete line of bonding mortars, and many specialized refractory materials.

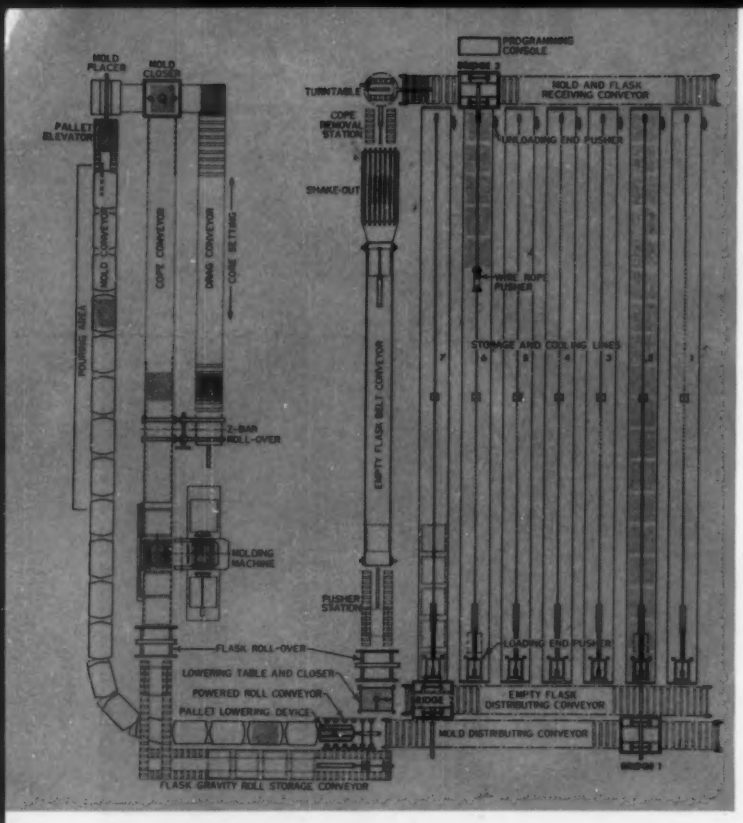
WRITE for the new descriptive folder, "Harbison-Walker Products for the Foundry Industry"—and for complete technical information, consult your nearest Harbison-Walker Sales Office.

Harbison-Walker Refractories Company

AND SUBSIDIARIES GENERAL OFFICES: PITTSBURGH 22, PENNA.

World's Most Complete Refractories Service

HW 60-14



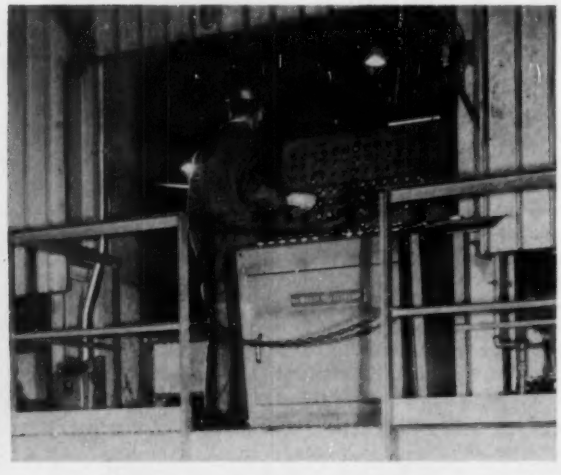
Drawing shows layout of the ductile iron line. Molding area is on left, cooling and storage on right

New Ductile Iron Line Features . .

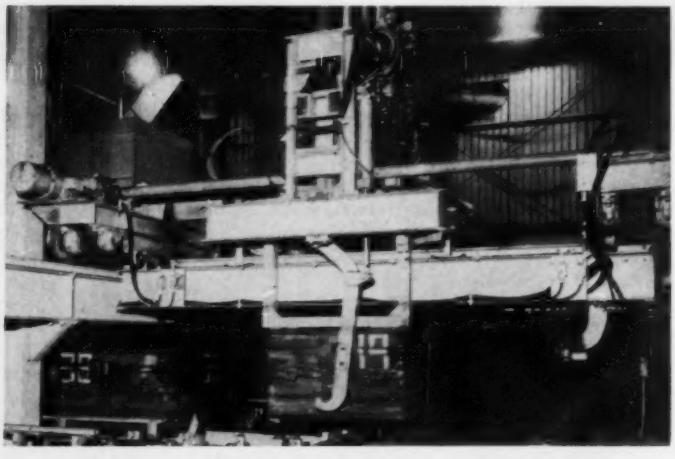
CONTROLLED

● NEW EQUIPMENT which provides for automatic production and handling of molds has been installed on a new ductile iron foundry line at the John Deere Malleable Works, Deere & Co., East Moline, Ill. Approximately 55 types of tractor and implement castings are produced on this line.

A novel method of annealing is an outstanding feature of the new installation. Controlled cooling of the castings while they are still in the mold imparts properties usually obtained through separate heat treatment. This annealing process is accomplished by automatic pro-



Grapple arms of a transfer bridge move cooled molds from cooling area to shakeout conveyor



Mold movement from pouring to the cooling lines is programmed. After a prescribed time, plus or minus 5 minutes, molds are sent to shakeout

Six lines are used for cooling, and the seventh stores empty flasks. Up to 19 molds can be cooled on each line from ½ to 1¾ hour, depending on casting section size

COOLING OF CASTINGS

gramming on storage and cooling lines. Castings are prescription cooled for any period from ½ to 1¾ hours, depending on casting size and shape.

The line produces molds weighing approximately 4500 lb, including flask. The permanent flasks measure 42 in. by 48 in., with 12-in. cope, 12-in. drag, and 2-in. upset.

The automatic mold and flask handling equipment is designed to handle from 30 to 90 of these large molds an hour through the cooling lines and up to 150 molds an hour from cooling lines to shakeout. The sand system handles 150 tons per hour of tempered sand and 250 tons per hour of shakeout sand.

Nine men are required to operate the line, including an operator, coresetter, clamper, two pourers, unclamper, console programmer, and parting station and shakeout operators. In addition to the production workers, a maintenance crew performs emergency and preventive maintenance.

Molding—Molds are made automatically by the molding machine, which alternately produces matching copes and drags. The machine delivers copes with the cavity down to a cope conveyor and delivers drags to a Z-bar rollover and (cavity up) to the drag conveyor. Cores are set in the drags manually as they advance on the conveyor.

At the closing station, copes and drags are aligned and closed automatically, then moved to the placing station. Enroute, the molds are clamped together manually. At the placing station, molds are placed automatically on the mold conveyor pallets, one mold to a pallet.

Mold Conveyor—The mold conveyor is a roller-type powered pallet conveyor traveling in an L-shaped path for a total distance of about 108 ft. It is arranged to operate at variable speed to handle the production of from 30 to 90 molds per hour.

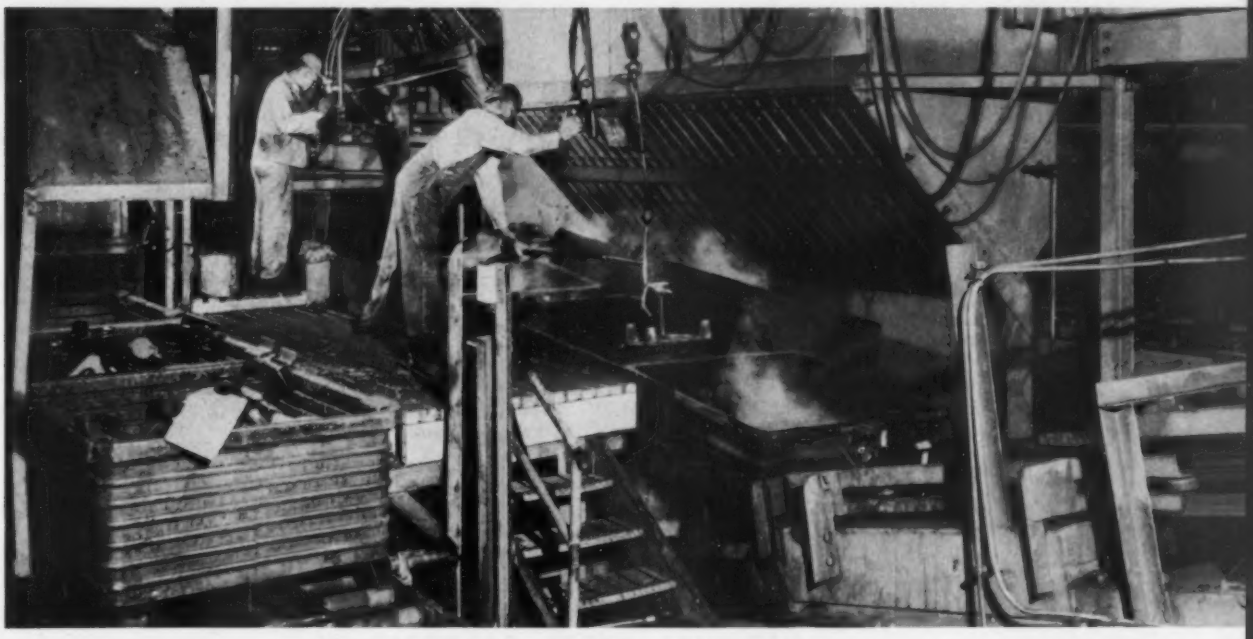
The conveyor line consists of 37 cast-iron mold-carrying pallets with machined tops. They are 43 in. wide by 67 in. long, spaced 6 ft on centers, and each is mounted on a welded steel chassis.

Pallets roll on a double row of ball-bearing-equipped gravity rolls on straight and curved sections of carrying and return run. The gravity rolls are mounted in channel frames. Pallets are moved along by pusher dogs attached to a single strand of rivetless chain.

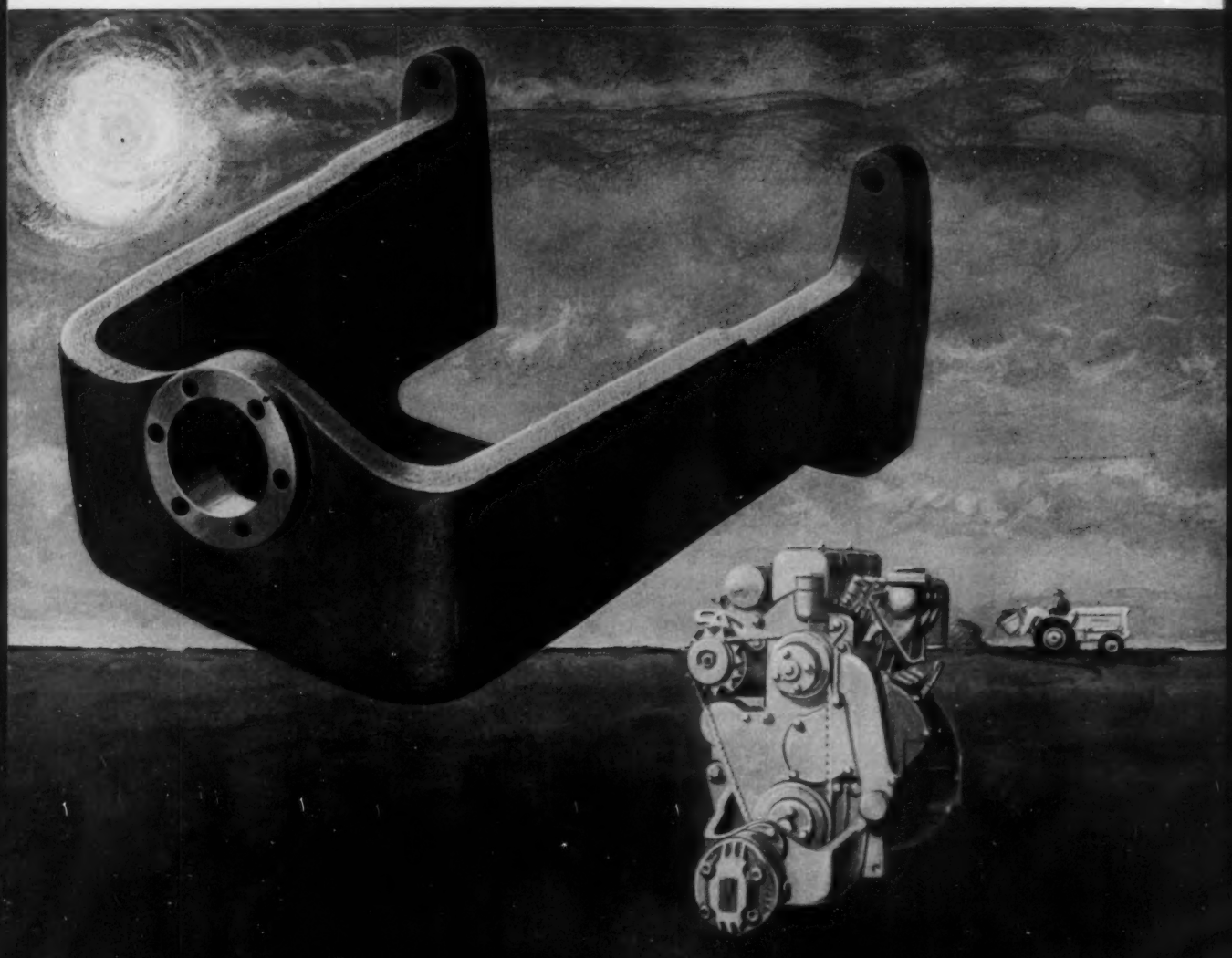
The conveyor is driven at 3 to 9 fpm by a variable-speed drive. Drive equipment includes a 3-hp motor, a variable speed transmission (3 to 1 ratio), and a double-reduction worm-gear speed reducer with geared flexible couplings connecting the shafts of the various units.

Running continuously, the conveyor carries the molds through the

Shakeout is 5 by 12 ft with a bar deck. Castings are hoisted from the drag and placed in tote boxes. The empty flask moves onto a conveyor



How the Foundry Industry Serves America . . . #17 of a Series



CAST IRON PUMP SUPPORT REPLACES WELDMENT, CUTS COST 43.7%

This casting is a heavy-duty hydraulic pump support. It is used in an industrial front-end loader designed to handle bulk materials. It was originally produced as a weldment, with 99 inches of welding joining its seven major steel parts. Total cost for the finished product was $15.65, including $2.83 for material cost and $12.82 for the 22 separate machining and fabricating operations required.

By redesigning the part to a single iron casting, the manufacturer improved the assembly alignment for service in the field, eliminated 19 of the assembly operations, reduced the manufacturing equipment needed and pared total cost to $8.80—a savings of 43.7 per cent! In addition, product appearance was greatly enhanced.

This is just one more example of how versatile, modern iron castings can solve many of the problems of industrial design and effect substantial manufacturing savings.

For the production of structurally sound iron castings, Hanna Furnace provides foundries with all regular grades of pig iron ...foundry, malleable, Bessemer, intermediate low phosphorus, as well as Hanna Silvery.

Facts from files of Gray Iron Founders' Society, Inc.

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For More Information Circle 598, Page 87

pouring area, through a short exhaust tunnel where hot gases and fumes are exhausted, and to the unloading end of the conveyor. The unloading equipment, which consists of a pallet and mold-unloading pusher, a pallet-lowering device, and an unloading pusher, moves the poured mold onto the mold-distributing conveyor and places the empty pallet on the return run of the mold conveyor.

This distributing conveyor is a roller-flight conveyor, 51 ft long, which moves at 30 fpm. It consists of two endless strands of 6-in. pitch roller chain supporting ball-bearing-equipped idler rolls, 50 in. long, every other pitch, on which the pallets are carried. The idler rolls permit pallets to accumulate at the end of the conveyor while the chain passes beneath the pallets.

Programming Console—Molds are transferred automatically from the mold-distributing conveyor to any of six cooling lines by a traveling transfer bridge. An operator at the programming console selects the lines to be loaded and the number of molds, up to 19, to be loaded on a line. Selection is dependent on the number of molds in a particular production run which have the same prescribed cooling time.

The operator selects the next line to be loaded and the number of molds to be loaded on it. The system then automatically fulfills the first selection and proceeds to the next one.

Traveling Transfer Bridges — Three traveling transfer bridges transfer molds to and from the storage and cooling lines. Two of the bridges are located at the entry end and one at the delivery end. The two bridges at the entry end are 20 ft wide and straddle the mold-distributing conveyor and empty-flask distributing conveyor as well as the entry end of the cooling lines.

Bridge 1 can transfer molds to cooling lines 1 through 6. Bridge 2 is used primarily to transfer empty flasks to line 7 for storage, but can transfer flasks to line 2 through 6.

Each bridge moves at 90 fpm when traveling between stations in either direction, but, to provide more accurate stopping, automatically slows down to 30 fpm as it nears the desired station.

A grapple carriage picks up each mold in turn and deposits it on the cooling line after the bridge has positioned itself at the desired line. Bridge grapples, grapple hoists, and grapple carriage are operated by double-acting air cylinders.

Storage and Cooling Lines—Six of the mold-storage and cooling lines are used for cooling and one for empty-flask storage. These lines consist of roller-bearing-equipped rollers carried in a channel frame about 5 ft above the foundry floor.

When the traveling transfer bridge deposits a mold on the line, an air-cylinder pusher dog, actuated by a limit switch, moves the mold forward the distance of one mold. Succeeding molds are pushed one against the other. In this manner the traveling bridge can continue to deposit molds until 19 have been accommodated.

Two men pour molten metal into molds as they travel along the 108-ft conveyor. Speed of the line is variable to handle 30 to 90 molds per hr

After the prescribed cooling time, as determined by the programming console operator, the castings are removed and sent to shakeout. This action is taken within plus or minus five minutes of prescribed cooling time to provide optimum annealing of each type of casting.

Unloading of flasks from the cooling lines is accomplished by the third traveling transfer bridge, in a procedure similar to that of loading the lines. The traveling bridge unloads the first mold onto the

In the interest of the American foundry industry, this series of ads also appears in

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For More Information Circle 598, Page 87

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is "insurance" for the Vilter foundry where VILTRITE castings have to be right the FIRST TIME. The superintendent there specifies BERLITE for lining ladles because his long experience shows consistently...absolutely

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All the facts on this BERLITE application are available from Ironton. If you want to test Ironton BERLITE in a ladle, let us know. We will show you what a RELIABLE REFRACTORY can do!

THE IRONTON NORTH AMERICAN REFRACTORIES CO.
CLEVELAND 14, OHIO

For More Information Circle 600, Page 87

flask-receiving conveyor leading to the shakeout. As soon as this mold has been lifted from the cooling line, a cable-driven, counterweighted pusher advances another mold to the proper position for pickup by the bridge. In this manner, 19 molds can be transferred to shakeout quickly within the critical prescription cooling period.

Shakeout—Molds advance to the shakeout area on the mold and flask-receiving conveyor, and a turntable turns them 90 degrees. An operator removes the clamps manually from the mold, and the mold is advanced by pushbutton startup onto the cope-removal station, where the operator removes the cope with a hoist.

The drag then moves forward onto the shakeout. The cope, previously lifted with the hoist, is rotated 180 degrees about the trunnions and lowered into position for transfer into shakeout. Castings are removed from the drag while it is on the shakeout by a second hoist and are deposited in a totebox.

The heavy duty shakeout is 5 by 12 ft, with a bar deck. A sand-collecting hopper beneath the shakeout delivers sand to a conveyor with a magnetic head pulley and to a bucket elevator which conveys used sand back to the sand preparation area.

Empty flasks from the shakeout automatically are fed by a system of conveyors either to the empty storage line in the cooling and storage area or to the molding machine. Because the shakeout rate is about 150 molds per hour compared with the maximum production rate of 90, the system sends flasks to production and to storage automatically.

Empty flask assemblies are handled through the shakeout the same as molds, except that no clamps have to be removed and no castings or sand handled. At the end of the day, when no more molds are poured, all flasks are assembled empty and stored on the tiers, except for certain large castings which remain in the mold overnight. They are handled the following morning in the same fashion as newly poured molds.

Link-Belt Co., Chicago, furnished the automatic mold and flask handling equipment, the storage and cooling lines, the sand handling system, and the shakeout.

At Adell Foundry Co. in Wisconsin, Supt. Bintzler gets

6 months service from "SPLITS and BERLITE" ladle lining

Mr. Bintzler (stand on wheel) and helper with BERLITE-lined ladle.

EASY WORKING, EASY CLEANING

that's what foundrymen want in a lining for grey iron ladles. At Adell they say nothing ever tried can equal

IRONTON BERLITE

The "Bintzler Sandwich" of BERLITE and brick may be the lining you need. All the details are in a service report that Ironton will send with out obligation. Try BERLITE and see why so many foundrymen say it's the only lining they will use for bull and pouring ladles.

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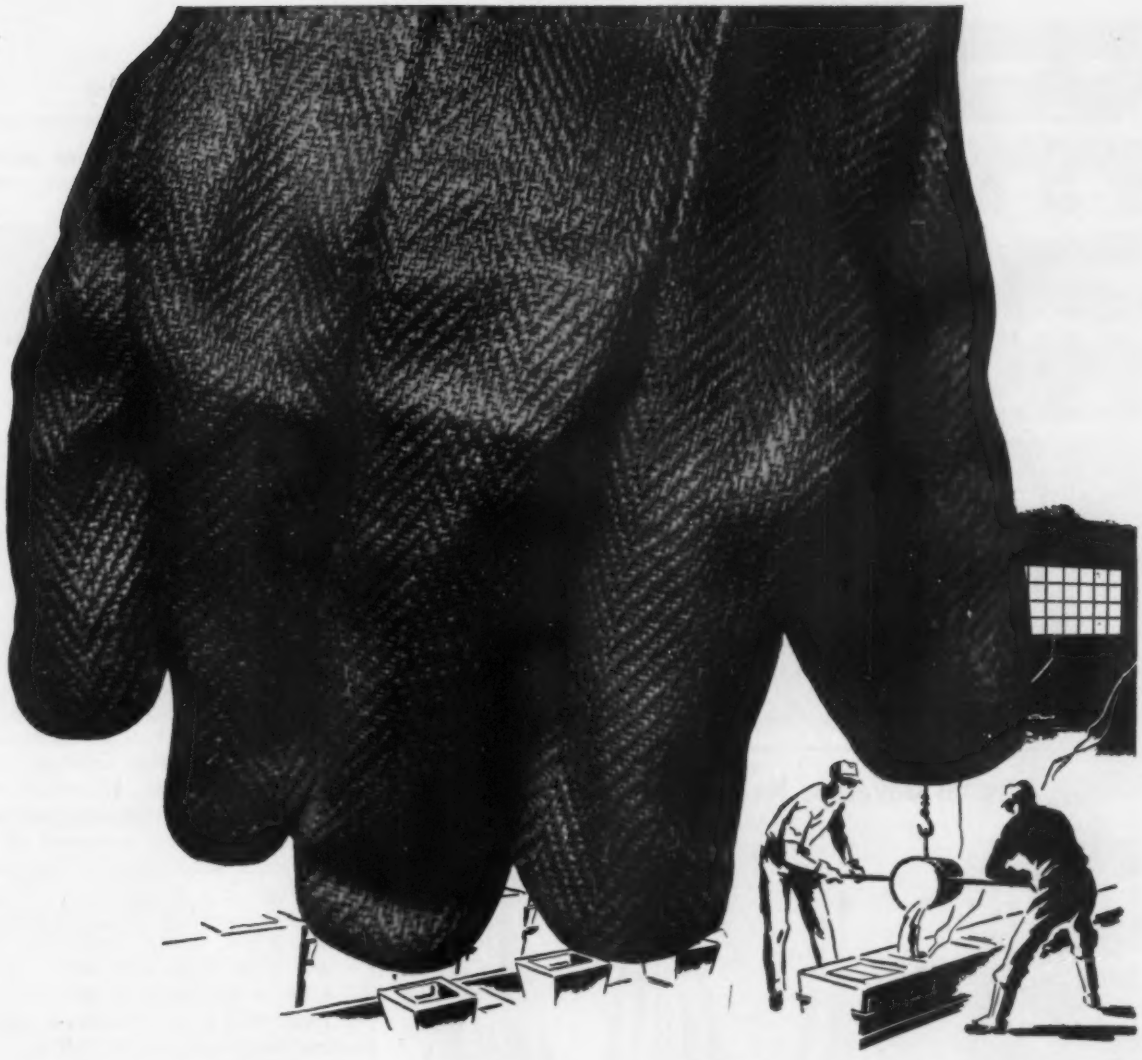


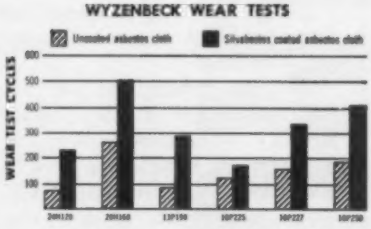
Silvabestos® doubles foundry glove life

Wear tests prove R/M Silvabestos® cloth outwears uncoated asbestos cloths by as much as 249%. No wonder it's a favorite for tough, abrasion-resistant foundry gloves and safety garments.

Stop paying for frequent glove replacement. Start enjoying the extra flexibility, light weight, and heat resistance of gloves made of genuine R/M Silvabestos. A new high in protection.

R/M makes the cloth—safety garment manufacturers fabricate it into gloves and a full line of safety clothing. Ask your regular supplier for Silvabestos cloth in all your foundry protective garments . . . or write us for names of fabricators.

Superior wear of Silvabestos (black bars) vs. uncoated asbestos cloths of the same grades is shown in test findings at right. *Note:* Silvabestos should not be used in contact with open flame.



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For More Information Circle 602, Page 87

FOUNDRY DEVELOPMENTS

By EDWIN BREMER
Metallurgical Editor

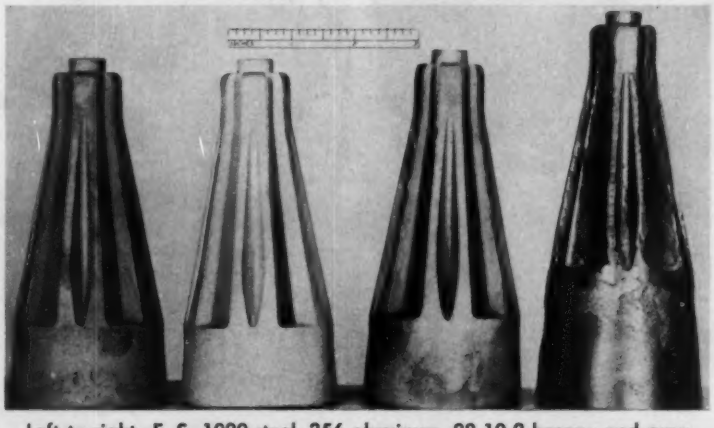
Improves Properties

MOLTEN salt-bath process which can be applied to mild, stainless, and alloy steels and to cast irons to produce tough, wear-resistant surfaces and increased fatigue strength is reported by Kolene Corp., Detroit. Called "Tufftriding," the process was developed by Degussa-Durferrit, West Germany. Principal components of the bath are potassium cyanide and potassium cyanate, into which dry air is injected. Bath operates at 1000 to 1050° F, and treatment time is from 1½ to 2 hours. Process is said to form nitrides at the surfaces of ferrous materials, but the surface is ductile, and the parts treated do not grow. These characteristics permit treatment after the parts have been finished completely.

Hardens Vise Teeth

ALTHOUGH hardening is not applied commonly to ferritic grades of malleable iron, Milwaukee Malleable & Grey Iron Works, Milwaukee, found a favorable balance of mechanical properties by using flame hardening on the teeth of a ferritic malleable chain vise. Through experiments, an ideal hardness of 35 Rockwell C was established. At that level the hardness is sufficient for the teeth to provide a good bite on the work, but the inherent damping capacity of malleable iron still is present to absorb shock and impact forces effectively. The vise has been on the market for three years, and in that period there have been no failures due to either brittle fracture or deformation of the teeth.

Arsenal Develops New Molding Material



Left to right—F. S. 1020 steel, 356 aluminum, 88-10-2 bronze and pure titanium flash suppressor castings made in new molding material

A NEW molding material has been developed at Watertown Arsenal, Watertown, Mass., as part of work being done there in the casting of uranium. The mold mix consists of only one binder and any common fine-grain refractory such as silica or zircon sand. Reported advantages are that molds made of this material do not evolve gas during pouring; do not react with most metals, including uranium, and can be mass produced in the same manner as resin-bonded shell molds.

The flash suppressor castings shown here are the first to be made with this molding material. The parts, left to right, were cast of 1020 steel, 356 aluminum, 88-10-2 bronze, and pure titanium.

A patent application for the new process has been made, and details are expected to be released shortly. Bryant W. Crocker is the inventor.

Soviet Riser Sleeves

ACCORDING to the February issue of *Liteinoe Proizdostvo* (Russian Castings Production, BCIRA translation) Soviet foundrymen are using a mixture of charcoal and sawdust for making exothermic sleeves used on risers for steel castings with satisfactory results. Material is said to be less expensive than other types.

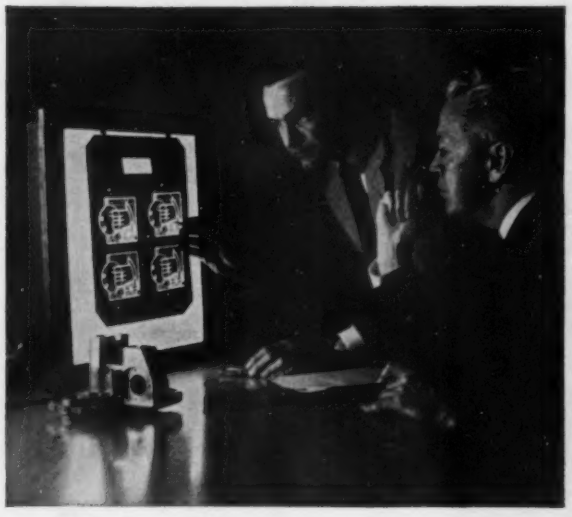
The mixture is composed of 80 per cent wood charcoal (screened through 2 x 2 mm sieve), 15 per cent dry sawdust (screened through 3 x 3 mm sieve), 5 per cent clay and 2 to 3 per cent sulfite pitch. Clay or bentonite is added in the form of a slurry. Formed sleeves are baked at 140 to 150° C (285 to 300° F) for four to five hours. They tend to pick up moisture and should not be placed in the mold more than two to three hours before pouring. If stored for more than 48 hours they must be redried for at least an hour.

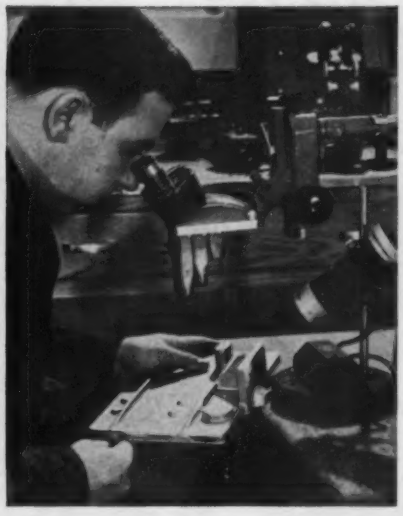
Vacuum Melting

INFORMATION on vacuum induction melting of iron and steel is presented in two reports available from the Office of Technical Services, U. S. Department of Commerce, Washington 25. One designated PB 161,764 is entitled "Vacuum Induction Melting, Oxygen and Carbon in Iron" by J. E. Srawley, and the price is 50 cents. The other is PB 161,928, "Theoretical and Practical Aspects of Vacuum Induction Melting of High-Strength Steels" by P. S. Schaffer, and the price is $2.

REVERE PRIMARY ALUMINUM

FOR FOUNDRY AND DIE CASTING USES





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Write to American Smelting and Refining Company, 120 Broadway, New York 5, New York, for your copy of Bulletin 195, "Revere Aluminum for the Casting Industry."

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REVERE ALUMINUM

For More Information Circle 603, Page 87

IMC A REPORT TO FOUNDRIES FROM TOM BARLOW

Sure as Shooting!

Seems like a long time since ECP revolutionized the patching of cupolas by introducing the Bondactor Process. Now we are ready to start another revolution. If you can shoot (gun) a cupola — why not a ladle? Let's look first to see if it makes sense (or dollars).

A cupola is patched every day and lined once or twice a year. A ladle is normally patched less often — but lined more often. Of greatest importance is the fact that when a ladle lining gets thin, *it is knocked out*. There is often more refractory thrown away than burned out. This could be avoided by a good patching method which would avoid knocking out good refractory. *This is a natural for shooting.*

A lot of plastic material is used in ladles to keep them in repair. This ladle refractory requires hand labor and lots of it. *This is a natural for shooting!*

Ladles are more apt to fail by slag attack than by actual burn-out. In fact, the ladle lining never gets as hot as the metal. So our problem is to get a dense, uniform lining which will resist chemical attack. *This is a natural for shooting!*

So—we have spent several years developing a practical and economical solution. NOW IT'S READY!!

First — any of our five models of Cupolinors can be used for gunning ladles, but the little Cupolinor "77" was the one created especially for the purpose. Its small size, easy portability, slow feed and price tag under $1,000 are deliberately designed to be convenient for ladles, forehearths, spouts, runners, etc.

Second — we need an ideal, dry bagged material produced for easy shooting. This is our new product CLL-25. This especially created ladle refractory is shipped in bags so you don't pay freight on water. It can be shot, as it comes from the bag. It can be rammed by moistening to about 8% water in a mixer. It can be used as a plastic by adding about 12% water.

Now, any ad is bound to say the product is good — or even better than ever. It seems a waste of space to make the usual claims — but what else can we do? We say simply that this new product is the best, the cheapest, the most convenient and the most economical product for handling your miscellaneous ladle (etc.) patching—whether you use rammed or plastic refractories. When combined with a Cupolinor (especially the "77" model), you have a new and better method of keeping your ladles in shape — *sure as shooting.*

P. S. CLL-25 can be shipped in cars of Cupoline "77" or Cupoline. You can handle all your patching problems in one shipment.

P. P. S. Would you like to try CLL-25 — soon?

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Eastern Clay Products • Industrial Minerals Division • Administrative Center • Skokie, Illinois

IMC

FS-3-2

Operating Problems Discussed at

PENN STATE CONFERENCE

By WILLIAM G. GUDE
Editor
and
JACK C. MISKE
Associate Editor

● THE third biennial Foundry Conference at Pennsylvania State University drew an attendance of 220 persons to the campus on June 22-24. Co-operating in sponsoring the conference were 13 eastern chapters of the American Foundrymen's Society and independent foundry associations.

Twenty-five technical discussions presented at eight sessions were concerned largely with practical subjects for the operating foundryman.

The conference was opened with a luncheon on Thursday at which Dr. E. F. Osborn, vice president of research, Penn State, welcomed the visitors and discussed various of the university's activities. The school's annual budget for research work currently is $11 million, 60 per cent of which is financed by the federal government, 20 per cent by the state, and 20 per cent by industry.

Dr. David H. Morgan, director, college relations, Dow Chemical Co., Midland, Mich., and president, Foundry Educational Foundation, addressed the Friday evening banquet. Speaking on the need for co-operation between industry and higher education, he stressed the importance of seeing that additional engineering students acquire a better understanding of casting as a manufacturing process and castings as engineering materials. This could be accomplished, he pointed out, if it were possible to expand the FEF program beyond the 17 schools with which it now is identified.

Two technical sessions each were devoted to gray and malleable iron, nonferrous alloys, steel, and sand.

Gray and Malleable Iron—Three sound filmstrips prepared by the Gray Iron Founders' Society were presented by Charles F. Walton, its technical director. The films were titled "What Is Gray Iron?," "The Properties of Gray Iron," and "The Properties of Ductile and High-Alloy Irons."

(Photo by Walter Napp, Milwaukee Chaplet & Mfg. Co.)

Conference officials included, left to right standing, H. P. Good, Textile Machine Works, treasurer; W. P. Winter, Pennsylvania State University, secretary; and J. T. Gresh, American Brake Shoe Co., vice chairman; and, left to right seated, Robert McCord, Pennsylvania State University, honorary chairman, and T. E. Eagan, Cooper-Bessemer Corp., chairman

"Control Tests for Gray Iron Production" by D. E. Krause, director, Gray Iron Research Institute, emphasized the dependency of good iron quality on the use of all available controls, not only one or two. He discussed methods of testing and controlling the charge, cupola dimensions, air, metal temperature, metal fluidity, carbon equivalent, chemical analysis, etc.

"Basic Sand Control—Through Controlling Mold Quality and Moldability" by Harry W. Dietert, Harry W. Dietert Co., Detroit, described recent work by the author in new methods of sand control. (See FOUNDRY for May, Page 238, and June, Page 164.)

"Quality Cast Iron—A Critical Appraisal" by William H. Moore, vice president, Meehanite Metal Corp., New Rochelle, N. Y. The foundry industry's battle for survival may well be a blessing in disguise if it is successful in stimulating foundrymen to improve their techniques. In a span of 50 years gray iron has progressed from a tensile strength of 20,000 psi to about 200,000 psi, but many foundries—and some engineers—still think of cast iron as it was 50 years ago. For instance, the American Gear Manufacturers' Association has only one design rating for cast iron; it is based on 20,000 psi tensile strength. The major part of Mr. Moore's discussion was concerned with control of graphite shape and form and the variables connected with cupola operation.

"Pearlitic Malleable—A Metal of Many Uses" by Hans J. Heine, technical director, Malleable Found-

ers' Society. Chiding the industry on its parochial views, he urged foundrymen to get out and see what the competition is doing. Much of the foundry industry's thinking on properties is outdated—as also is that of too many handbooks and manuals used by designers. Among the family of cast irons, pearlitic malleable's ten-fold increase in demand since 1945 is the result of its flexibility in application and performance. Microstructure, the important factor in determining machinability ratings, should be understood and analyzed as a part of foundry operation.

"Nondestructive Testing—Its Application to Malleable and Gray Iron Castings" by Herman Giudici, assistant chief metallurgist, American Chain & Cable Co., Reading, Pa. Three of the more common testing methods are the dye check test, magnetic particle inspection, and radiography; the last is being used increasingly by larger foundries. Ultrasonic testing has an important place as an inspection method, provided that the castings are adapted to this process and interpretive experts are available.

Nonferrous Alloys—"Ways and Means of Improving Physical Properties of Copper and Aluminum Castings via Grain Refinement, Degassing, and Risering" by Donald E. Wyman, Exomet Inc., Conneaut, Ohio. This discussion concerned methods of controlling porosity, thermal gradients, and grain size, including use of insulated risers to restrict heat loss.

"Effects of Treating Copper-Base Alloys with Various Chemicals and Results on Casting Quality and Structure" by Jack Morgan, Foseco Inc., Berea, Ohio. The speaker reviewed standard chemical methods of treating these metals to reduce melting losses; prevent dross formation; remove gases, and produce the correct grain structure in the casting.

"What's Wrong with Copper Alloy Castings" by Herbert F. Scobie, executive secretary, Non-Ferrous Founders' Society. This subject was examined from the standpoints of the producers of competitive materials—who attempt to downgrade castings—the customer, and the foundryman. Because consumers anticipate increased use of nonferrous castings in the future, foundrymen should base their plans on this prospect.

"Simplified Approach to Brass and Bronze Castings" by J. D. Allen, Federated Metals Div., American Smelting & Refining Co., New York, and "Simplified Approach to Better Aluminum Castings" by D. L. LaVelle, Federated Metals Div.

This dual presentation was primarily a question-and-answer session in which the discussion ranged over a variety of subjects from melting to pouring to gating. Porosity, shrinkage, fluxing procedures, pouring practices, grain size, and many other topics were covered in a stimulating give-and-take manner.

Some of the high points included the following:

1. Cooling rate is a critical factor in copper-base castings. In smaller castings, solidification can be so fast that porosity is dispersed and invisible. In larger castings, with slower cooling, voids appear. Shrinkage sometimes is mistaken for gas porosity, and degassing in such instances only aggravates the shrinkage. In aluminum, gas and shrinkage are related intimately. Each increases as the other decreases and vice versa.

2. With copper-base alloys, dropping metal through a long fall is not serious except with the aluminum and manganese bronzes. Aluminum, on the other hand, should be held to as short a fall as possible during all transfers. When possible, the sprue should be placed at the edges of molds.

Steel—"Coremaking and Molding with Furans" by Robert J. Mulligan, Federal Foundry Supply Div., Archer-Daniels-Midland Co., Cleveland. The furans, which react with heat, acid, or both to change from a liquid to a hard resin, are used in several forms. The 100 per cent furan is better known as self-curing resin, and the 20 per cent furan, 80 per cent urea formaldehyde blend now is called "hot box" resin. A third type is half furan and half urea formaldehyde. It is self-curing, too.

"No, I don't want to get in on a baseball pool. I'm too smart to take chances"

Only the 100 per cent furan is fully suited to steel foundry operations. The others present problems of pinholing as a result of gas evolution from the urea and of erosion because of the fast collapsibility of mixes containing urea.

The self-curing types offer the possibility of a new shell molding technique employing a cold pattern of which cheap plastic duplicates could be made to increase production at low cost. This method visualizes use of a contoured head on the blow chamber, with blowholes at noncritical areas. The operator would blow cold sand and move the mold to a stand to cure; his production rate would be linked to hardening time.

Steel foundries also may come to use the "hot box" mix in combination with core oil. This procedure provides the advantages of the resin, but contains too little urea to create a pinholing problem. It also is relatively inexpensive because about 3 parts core oil would be used to 1 part hot box resin. Cores made with this mixture can be baked quickly with minimum warpage.

"Melting and Deoxidation Practices Pertaining to the Foundry" by Roy A. Frost, Vanadium Corp. of America, Chicago. Fluidity of molten steel is more related to chemistry of the metal than to high temperature. Production of good quality metal requires clean charges with proper section sizes. Proper use of the oxygen lance also is needed. A boil to reduce silicon and float off nonmetallics is desirable and should be performed for about five minutes before the tap.

Important steps in melting steel include balancing the slag, preparing charges, making alloy additions, and adjusting the melt. Each is vital.

"A Polymeric Sand Additive" by Richard D. Green, Dow Chemical Co., Midland, Mich. New foundry

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sand additive called Bonaril 11 reportedly can be used to replace cereal in molding sands. It is used in amounts ranging from ¾ to 1 lb per ton of sand. Because it is compatible with cereal and dextrin, the new material is not detrimental to a sand system with an influx of residual cereal. Benefits are said to include easy mulling, lower moisture requirements, short wet mulling times, better sand flowability, increased mold hardness, more hot strength, and reduced gas evolution.

"Risering and Padding with Moldable Exothermics" by Douglas B. Beath, sales manager, foundry products division, Foseco Inc., Berea, Ohio. Whether to use exothermics is a matter of economics. Potential savings include increased yield; reduction in molding costs through lowering of cope height; reduction in riser cut-off and grinding; reduction in tonnage of risers recirculated through the shop; reduction in cleaning room costs.

"Advances in Magnetic Particle Techniques for Steel Castings" by Kenneth Schroeder, Magnaflux Corp., Chicago. The wet method of testing compared with the use of prods and dry powder provides greater sensitivity, except for subsurface defects. Major savings are possible in the case of extra large castings in inspection time. (See FOUNDRY, July, Page 106.)

"Resin Coated Sand and Its Fundamentals" by Frank W. Less, Hooker Chemical Corp., Durez Plastics Div. Procedures in the hot and cold coating processes were described. Mulling time is important and must be varied according to type of muller, amount of resin used, and batch size. Overmulling can cause loss of strength, a condition which also can result from excessive removal of fines from the mix, and from addition of too much wax.

Two Sand School Sessions

Sand School—At the first sand session, a three-member panel presented separate discussions of "Sand and Sand Properties" in terms of gray iron, steel, and nonferrous sands and then answered questions from the floor.

George John, Textile Machine Works, Reading, Pa., covered gray iron. In recent years, there has been considerable development of synthetic sands to cope with the change from limited production by skilled workers to high production by machine operators and to provide consistent controls. A good sand mix should provide the finish and tolerances specified, avoid surface blemishes, and be economical. The ideal sand would be a type for all work in the foundry and would contain a minimum of ingredients, preferably only sand, clay, and water. As yet, it has not been achieved.

Mold Hardness Important

The discussion of steel sands was offered by Edwin J. Richard, Bethlehem Steel Co., Bethlehem, Pa. At Bethlehem Steel, castings ranging from 100 lb to 100 tons are poured from the same heat. A total of 21 sand mixes are in use by the company, and new ones are being developed constantly. The 21 consist of two classes, oil and clay-bonded and air setting (the latter are baked). Every foundry needs to run at least two tests—those for moisture and green mold hardness. These tests are easy, require no special labor or equipment, and provide a great deal of information. Mold hardness is the single most important test. Better hardness (85-90) keeps up all other properties of value, such as green compression, dry compression, etc. Only permeability drops.

Nonferrous sands were analyzed by George D'Andrea, Danko-Arlington Inc., Baltimore. At Danko-Arlington, production is 90 per cent aluminum-base and 10 per cent copper-base castings. A high strength sand is used because the flasks are crowded. Production is chiefly short-run, highly accurate, close tolerance castings. A straight synthetic sand is used which consists of 500 lb washed and dried sand of 150 AFS fineness; 40 lb western bentonite; 40 lb southern bentonite; 10 lb buffer material; and 4 per cent water.

The foundry attempts to maintain 15 lb green compression, 30-40 permeability, 70 flowability, and 3.5 moisture.

Second Sand School included a panel of three speakers who discussed "Sand and Binder Control" by relating practices employed at their individual plants. Control in the steel foundry was described by S. B. Donner, plant manager, Donegal Steel Foundry Co., Marietta, Pa. J. O. Ochsner, Crouse-Hinds Co.,

Syracuse, N. Y., spoke on sand control for the nonferrous foundry. Gray iron practice was covered by James J. Silk, Taylor & Co., Brooklyn, N. Y.

Concluding paper of the session, "Wetting Agents in Sand," was presented by William N. Richards, president, Deynor Corp., Mamaroneck, N. Y. A detailed discussion of this subject by Mr. Richards was published in March FOUNDRY, Page 81.

Booklet Collects Papers On Grinding Stresses

"Grinding Stresses: Cause, Effect and Control" is a booklet of collected research papers and articles to promote a better picture of grinding stresses, their causes, effects and controls.

All material in the booklet is based on research sponsored by the Grinding Wheel Institute and the Abrasive Grain Association at Mellon Institute.

The reports are divided into five phases, from a condensation of known information on residual grinding stresses to a final section on the effect of residual stresses on fatigue strength. Copies of the booklet are available from the Grinding Wheel Institute, 2130 Keith Bldg., Cleveland 15, Ohio.

Report Lists Standard Samples For Spectrochemical Analysis

A listing of high-purity materials is included in *Report on Available Standard Samples and Related Materials for Spectrochemical Analysis*, published by American Society for Testing Materials. Quantitative spectrochemical analysis is based on comparison of unknown samples with standard samples of similar composition. There are 3400 entries of standard samples, reference samples, and high-purity materials in the report—an increase of 1300 in the 5-year period between revisions.

Among the materials covered are base metal and alloys of aluminum, iron, magnesium, zinc, lead, tin, copper, nickel, cobalt, titanium, and zirconium.

Copies may be obtained from ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa., at $3.75 each.

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Unbonded Molding Sand and Clay Bonds

By Prof. Willis G. Lawrence, Alfred University, Alfred, N. Y. Formerly with American Brake Shoe Co., where his work dealt with ceramic problems related to metal casting. Prof. Lawrence will discuss the properties of unbonded synthetic molding sands. He also will cover the differences in performance of western and southern bentonites and fire clay.

Mulling and Compacting Molding Sands

By Prof. Richard W. Heine, University of Wisconsin. Before entering teaching in 1947, Prof. Heine was associated with Socony Vacuum Oil Co., Michigan Steel Castings Co., and General Motors Corp. He will discuss mixing and compacting techniques, variations in properties, and the effects of clay and moisture contents on mold compaction.

CO_2 Process and Furan Cores

By Robert J. Mulligan, Archer-Daniels-Midland Co. He previously served as research chemist and as supervisor of foundry research and development prior to his appointment as general sales manager of the Federal Foundry Supply Division. This article will deal with specific problems and their solutions as well as the advantages and disadvantages of each process.

Oil Bonded and Shell Cores

By Edward C. Zuppann, Bendix Corp. Currently foundry manager of the company's Lakeshore Div. In this article Mr. Zuppann will discuss the testing and evaluation of materials, mixing problems, and hidden factors affecting quality. He will explain methods of coating sand for shell cores, types of resins, and relationship of grain fineness to resin content.

Be Your Own Sand Detective

By Joseph Schumacher, Hill & Griffith Co., Cincinnati. Mr. Schumacher is vice president in charge of research, development, and engineering for his company. He will discuss sand testing and the proper evaluation of test data. The article will cover the new clay test, volatile carbon content analysis, dry compression testing, and mold hardness. The significance of each will be evaluated.

SAND SYMPOSIUM ISSUE

These five special articles, written by authorities in the foundry industry, will be featured in the October, 1961 issue of FOUNDRY—in addition to all regular monthly reports and departments. They will bring together in one report a valuable contribution to sand technology. Don't fail to read the Sand Symposium Issue.

FOUNDRY Penton Building, Cleveland 13, Ohio

By RALPH L. LEE, *President*
Lee Hobby Foundry, Birmingham, Mich.

Drama in Sand Testing

"In view of all the molding sand variables, I sometimes am amazed by the astronomical number of good castings that are made and sold"

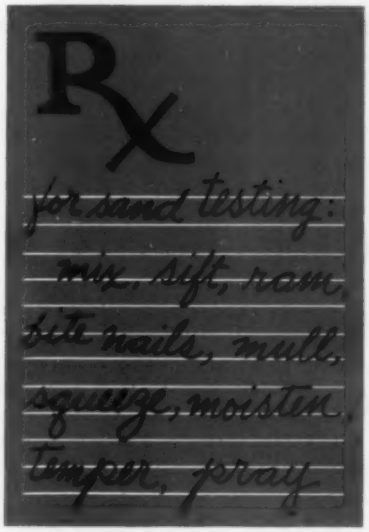
● IN VIEW OF the hundred and one factors that are supposed to enter into the selection and conditioning of molding sands—to say nothing of the thousands of possible combinations of them—it sometimes amazes me that the number of good castings made and sold is as astronomical as it is.

Over six years ago I was frustrated to the point of biting my nails as a result of an epidemic of molding troubles that defied me at every turn. After investigating every suspect, I cornered my sand as the real stinker. I concluded that it, like me, was just about worn out.

I talked to the chairman of the financial committee of the Lee Hobby Foundry (Mrs. Lee), who was and still is the Executive Chairman of the Board. It became apparent that in view of our small and erratic production schedules, we could not afford the sand testing equipment that respectable foundries on the other side of the tracks had found indispensable.

While attempting to improve the reliability of my long practiced hand-feel, squeeze, and roll technique of sand testing, I vaguely recalled reading or hearing about a method. It consisted of ramming up a green sand core and carefully placing it on a piece of paper on a thick book or some similar object. The piece of paper served as a conveyor to draw the core out over the edge of the book until a piece broke off of its own weight. The length of this piece in relation to the total length of the core was supposed to indicate the strength of the mix.

I even went so far as to build a tricky little gadget which would ram the core at a given pressure, then project it out of the box while indicating the relative length of the piece which broke off. The results were even more erratic than the hand - squeeze method. I must blushingly add at this point that my molding troubles turned out to have been caused by the pattern and by loose flask pins.

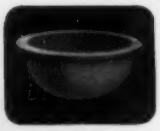


Nevertheless, bitten by the bug of interest in the whole subject of sand testing, I researched reams of technical literature on the subject, chatted with foundrymen in small shops, and dived head over heels into experimenting on my own account. As a result of all this activity, I couldn't avoid the conclusion that tensile strength had to be the only strength a sand mix could possibly have, no matter how you went about the testing of it. But, be this as it may, the problem of pulling apart a specimen—of green sand particularly—was a stinker of no small proportions. Most of this six-year adventure was devoted to attempts to accomplish this feat.

The pieces of apparatus I have designed, built, and discarded, plus volumes of test recordings, represent quite a morgue. But Eureka! (That's about the twelvth Eureka I have emitted joyfully during my quest.) At last I was able to test carefully prepared specimens of Albany No. 0 sand (weak at its best) with a repeatable accuracy which warmed my old, fluttering heart.

Finally, after all those years, I felt that I was in a position to get the truth as to whether a sand heap was worn out or not. So I ran an exhaustive set of tests on brand new Albany, right from the banks, and established with no question of doubt its actual tensile strength under accurately controlled and measured conditions of moisture, mulling, squeeze pressure, and tempering.

"And now for the payoff," I said



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to myself. "I will take these basic data and make a comparison between the brand new sand and my present heap of old, much used and abused, burned, parting-contaminated, wetting - agent - saturated sand, which is eligible for the dump."

Was I in for a shock! The consistently proven strength of the new Albany was 8.7 ounces per square inch. When I matched moisture for moisture, mulling for mulling, temper time for temper time and squeeze pressure for squeeze pressure, the strength for the sand in the old heap was, believe it or not, 14.8 ounces per square inch.

I naturally suspected the soundness of the whole project. In fact, I began to toy with the idea of chucking the whole thing, including the old sand, into the dump. I couldn't, however, for it haunted me and chased me back through all my records. There I discovered that 'way back, so long ago I had forgotten it, I had added 1 per cent bentonite to the heap. So in this sand testing drama, virtue wins by a narrow margin, as usually is the case in any drama. If the margin were not close, it wouldn't be a drama.

With my testing procedure backed up by the hand-feel, squeeze, and roll technique, I'm a little more comfortable regarding the mysteries of sand, but my fingers are crossed. I find that in the past my sand has been too wet. I don't know where I got the idea that it should be 8.5 per cent, but I'm shooting at 7 now. And I now know why over-ramming does no good. (Remember, I'm talking about Albany. Synthetic is another story.) A wetting agent works; I can prove it in tempering time. Tempering pays off too—at least for me.

Although I have no big muller for the heap, I know for a fact that thorough cutting and especially riddling are practically a must. Even without a muller, I've learned the trick of adding bentonite to bank sand without clay balls by mixing sand and riddling 1 part clay to 4 parts sand and riddling them dry over a very shallow heap. By moistening the container of my little lab muller—also the wheels and plow—I can hit the moisture I want right on the button, in dry weather or, in fact, at any time.

Well, I'm having fun in a crude and laborious fashion. Whatever you do, however, keep in mind that the Lee Hobby Foundry is as amateurish as all getout. It doesn't take itself too seriously and doesn't want anyone else to do it either—particularly those great big, superduper foundries on the other side of the track.

International Dictionary of Foundry Terms Is Published

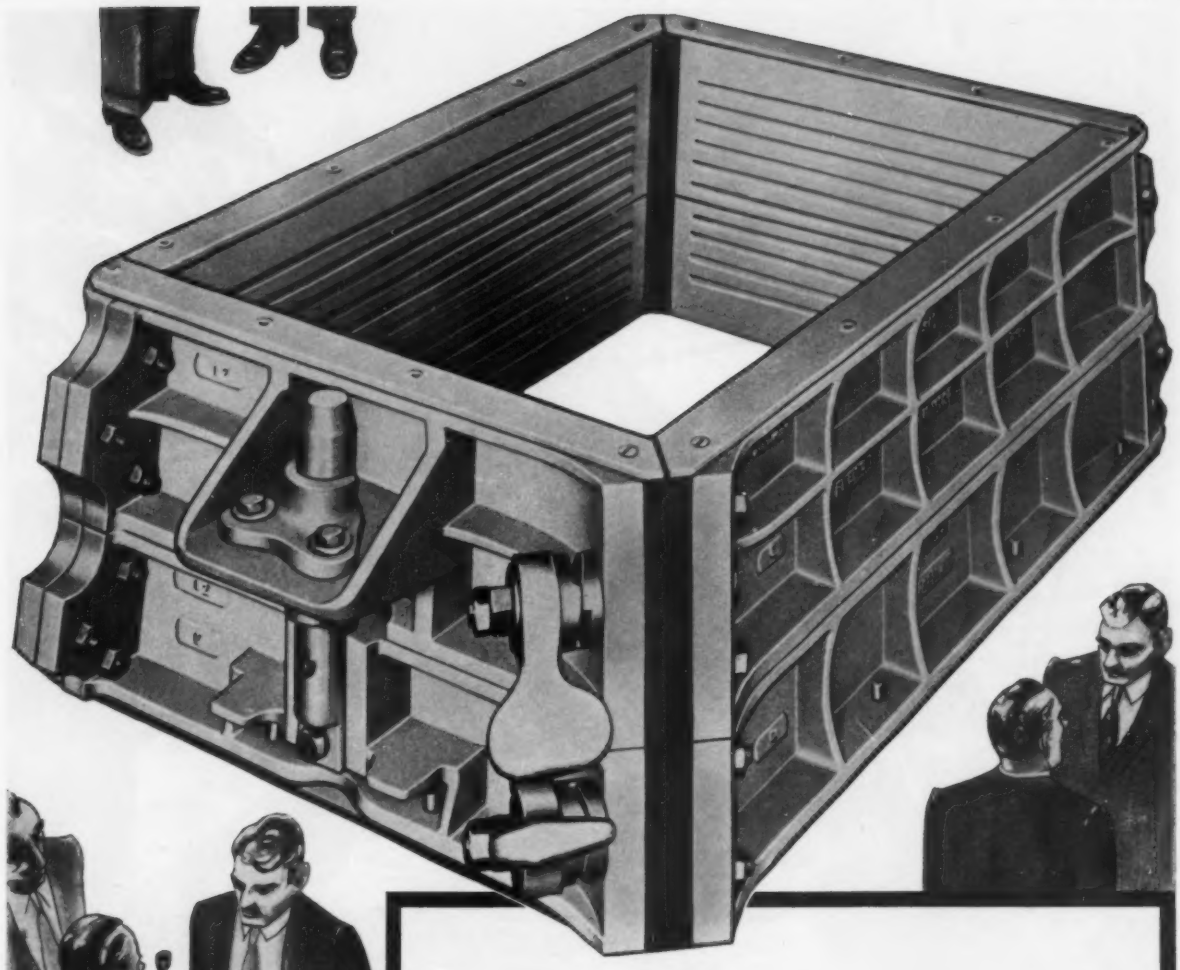
An International Foundry Dictionary, including terms peculiar to the foundry, as well as those of related techniques which are currently found in foundry papers, has been published by the International Foundry Dictionary Commission under the aegis of the International Committee of 22 foundry technical associations, with the collaboration of the national committee of each association and the co-operation of the Centre Technique des Industries de la Fonderie (France) and the advice of UNESCO.

The dictionary contains 2200 terms, in logical order, and 200 figures. The main volume is in eight languages: Dutch, English, French, German, Italian, Norwegian, Spanish, and Swedish. Illustrations are provided when they are considered helpful for clarification of the text.

The list of subscribers will close on October 15, 1961. Price is 66 NF. For subscriber members of foundry technical associations the price is 58 NF. After publication, the price will be 80 NF.

New England Chapter Elects Officers for 1961-62

Lewis W. Greenslade, Brown & Sharpe Mfg. Co., Providence, R. I., has been elected chairman of New England Chapter, AFS. Other officers elected for 1961-62 are as follows: Harry K. Sleicher, Seaboard Foundry Inc., Providence, first vice president; Daniel J. Pendergast, Waltham, Mass., second vice president; Frank Tibbetts, Wollaston Brass & Aluminum Foundry, Wollaston, Mass., secretary; and Thomas I. Curtin Jr., Waltham Foundry Co., Waltham, Mass., treasurer.



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"They're very dependable . . ."

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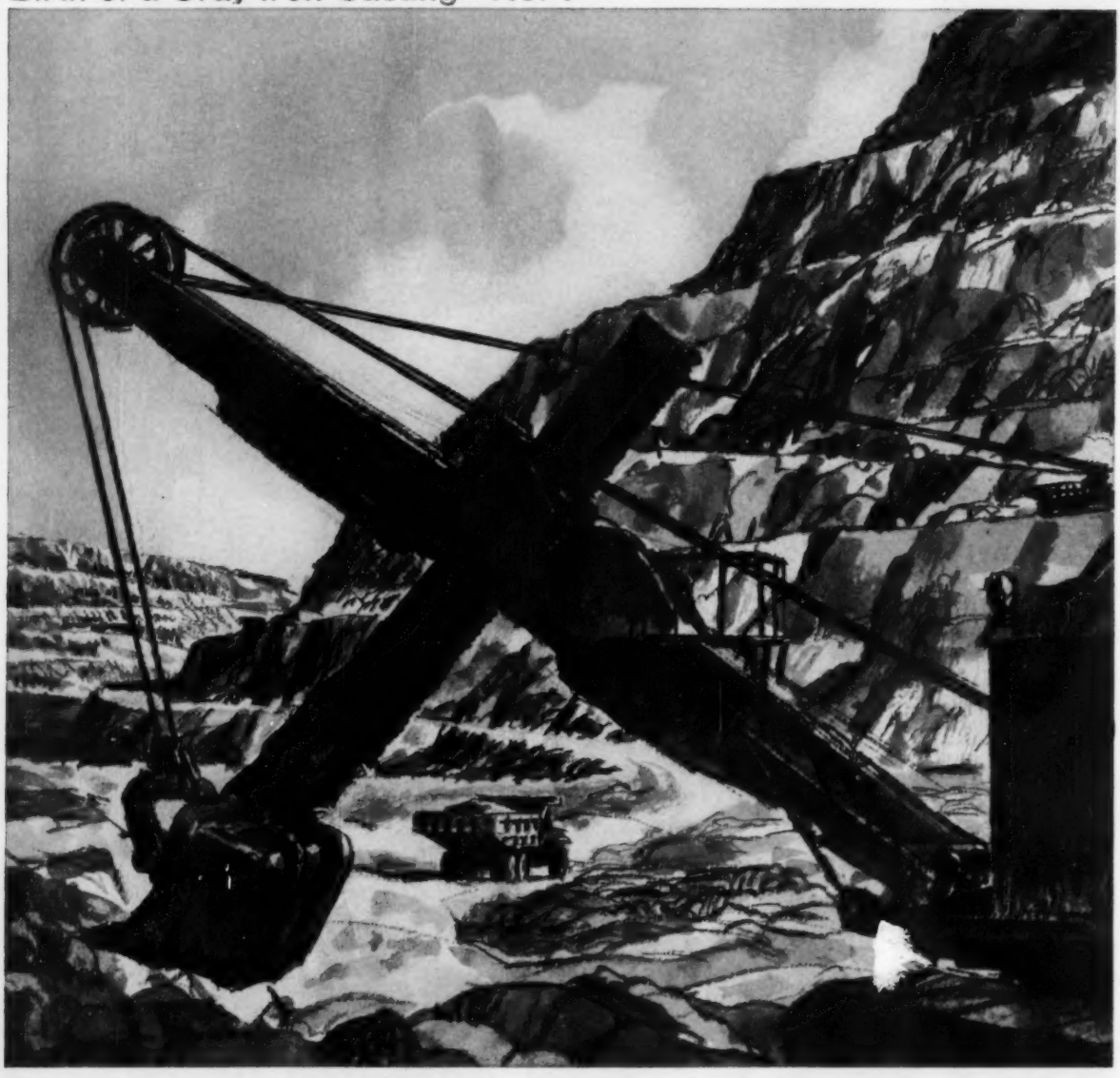
Birth of a Gray Iron Casting—No. 1



SELECTION OF ORES

From the great ore ranges in the Lake Superior Region and from other important deposits in the United States, Canada, South America and Europe come high quality iron ores . . . the basic ingredients of fine gray iron castings.

The famed "Mesabi" Range is probably the best known iron ore site in the world. It extends over 100 miles along Lake Superior in Northern Minnesota. Although mined extensively for over a half century, the Mesabi is still producing millions of tons of ore every year.

From this source and from sites located throughout the world, Pittsburgh Coke & Chemical Company selects only virgin iron ores to provide the foundry industry with Neville Pig Iron in a wide variety of analyses. The multitude of gray iron castings produced by these foundries play an essential role in the industrial growth of the nation today.

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JAPAN
Expands Use of
HIGH-STRENGTH CAST IRONS

By TOHRU TAKI
Metallurgist
Kubota Iron & Machinery Works Ltd.
Osaka, Japan

● RECENT improvement of cast irons in Japan is manifested in the high-strength irons. Their annual production during the last four years was 80,000 tons in 1957, 77,000 in 1958, 121,000 in 1959, and 173,000 in 1960.

The high-strength irons are divided into three series based on the manufacturing process. Irons in the first series are treated with magnesium and its alloys to produce ductile (nodular) irons. The eutectic graphite irons of the second series result from the use of special slags. Irons in the third series result from treatment with alloys other than magnesium and its alloys.

Irons in the first series and the Meehanite metals of the third series are employed mainly in the larger foundries. The second and third series irons, except the Meehanite metals, are used in smaller foundries.

One of the irons in the second series is produced in a strong reducing atmosphere with a slag that includes TiO_2. Irons to be treated with this slag generally are melted in cupolas or electric furnaces. A typical slag includes 27 per cent SiO_2, 25 per cent TiO_2, 24 per cent CaO, and 9 per cent FeO. The irons produced contain at least 0.07 per cent Ti and have a eutectic graphite structure.

These irons, invented by Dr. H. Sawamura, honorary professor, Kyoto University, Kyoto, are characterized by good fluidity, good machinability, and high strength. Typical properties are shown in Table 1.

The third series of irons is the most abundant. Various additional alloys have been invented and now are available. More developmental work will be done.

An example of an iron in this series is one treated with alloys containing calcium. Table II gives the analyses of three additive alloys of this type invented by A. Kusaka, consulting engineer, Kure, Hiroshima Prefecture. These additive alloys melt into molten iron at 2640-2700° F. They are heavy enough to sink into the molten metal, and little oxidation film is generated on the surface of the molten iron. Accordingly, the alloys melt into molten iron easily and may perform the role of inoculant. Examples of iron treated with these alloys are shown in Table III.

Another iron in this group is produced by treatment with 0.5 to 4.0 per cent calcium silicide and 0.05 to 0.15 per cent fluorides of rare earth metals in a process invented by T. Nishihara, Kikutake Co., Fukuoka. These reagents react with molten cast irons to produce fine or nodular graphite. Typical properties of irons produced in this manner are shown in Table IV.

Data in this article were taken from *Imono* and *Gendai Chuzo*, two Japanese magazines of recent issue.

TABLE I—Properties of Titanium Cast Iron with Eutectic Graphite Structure*

Number	Chemical Composition, % C	Si	Mn	Cr	Mo	Ti	Tensile Strength psi	Hardness bhn
1	3.75	2.45	0.94	0.58	0.31	0.40	50,000	304
2	3.68	2.66	1.20	0.58	0.31	0.39	49,500	266

*This iron was invented by Dr. Sawamura, and is patented in Japan, U.S.A., and Germany.

TABLE II—Typical Alloys Containing Calcium

Calcium Alloys	Chemical Composition, % Ca	Mn	Ce	La	Fe	Si	Melting Point, °F	Specific Weight
Ca-Mn-Fe-Si	18	22	..	..	15	Bal.	1,870	3.6
Ca-Ce-La-Si	20	..	8	6	7	Bal.	2,050	3.2
Ca-Cr-Fe-Si	16	Cr 18	..	..	20	Bal.	2,010	3.8

TABLE III—Examples of Irons Treated with Alloys Containing Calcium*

Chemical Composition, % C	Si	S	Alloy Addition	Tensile Strength psi
3.20	1.62	0.068	Ca-Mn-Fe-Si, 0.4%	51,000
3.80	2.46	0.028	Ca-Mn-Fe-Si, 0.4%	59,500
3.74	2.94	0.020	Ca-Mn-Fe-Si, 0.4%	81,000

*The process of treating these irons was invented by Mr. Kusaka and is patented in Japan.

TABLE IV—Properties of Irons Treated with Calcium Silicide and Fluorides of Rare Earth Metals*

Condition	Tensile Strength psi	Elongation per cent	Scleroscope Hardness
As Cast	85,000-127,000	3.5-12.0	33-45
Annealed	71,000-93,000	11.0-26.0	26-33

*This process, invented by Mr. Nishihara, is patented in Japan.

View shows part of the 90 persons who attended the first annual meeting of the Ductile Iron Section, Gray Iron Founders' Society, at Case Institute of Technology

First Annual Meeting Held By

GIFS Ductile Iron Section

● DUCTILE IRON SECTION of the Gray Iron Founders' Society held its first annual meeting at Case Institute of Technology, Cleveland, June 26. Approximately 90 representatives of 45 companies participated.

Chairman of the meeting was John Perry, Grede Foundries Inc., Milwaukee, chairman of the GIFS Ductile Iron Committee.

Dr. Lynn Ebert, executive officer, department of metallurgical engineering, Case Institute, presented a discussion of "Heat Treatment of Ductile Iron," a research project sponsored by the Gray Iron Founders' Society. In this work, various amounts of manganese and silicon were added to an alloyed ductile iron containing a base analysis of approximately 3.70 per cent carbon, 2.45 per cent silicon, and 0.26 per cent manganese.

The effect of these alloying elements on the desired quenching temperature was determined by heating small specimens of each composition to temperatures ranging from 1400 to 1800° F.

Specimens for hardness and tensile testing of each were austenitized at optimum temperatures selected, quenched, and tempered over a 400 to 1250° F temperature range to determine response to tempering. Jominy specimens of all compositions were quenched at 1550 to 1700° F.

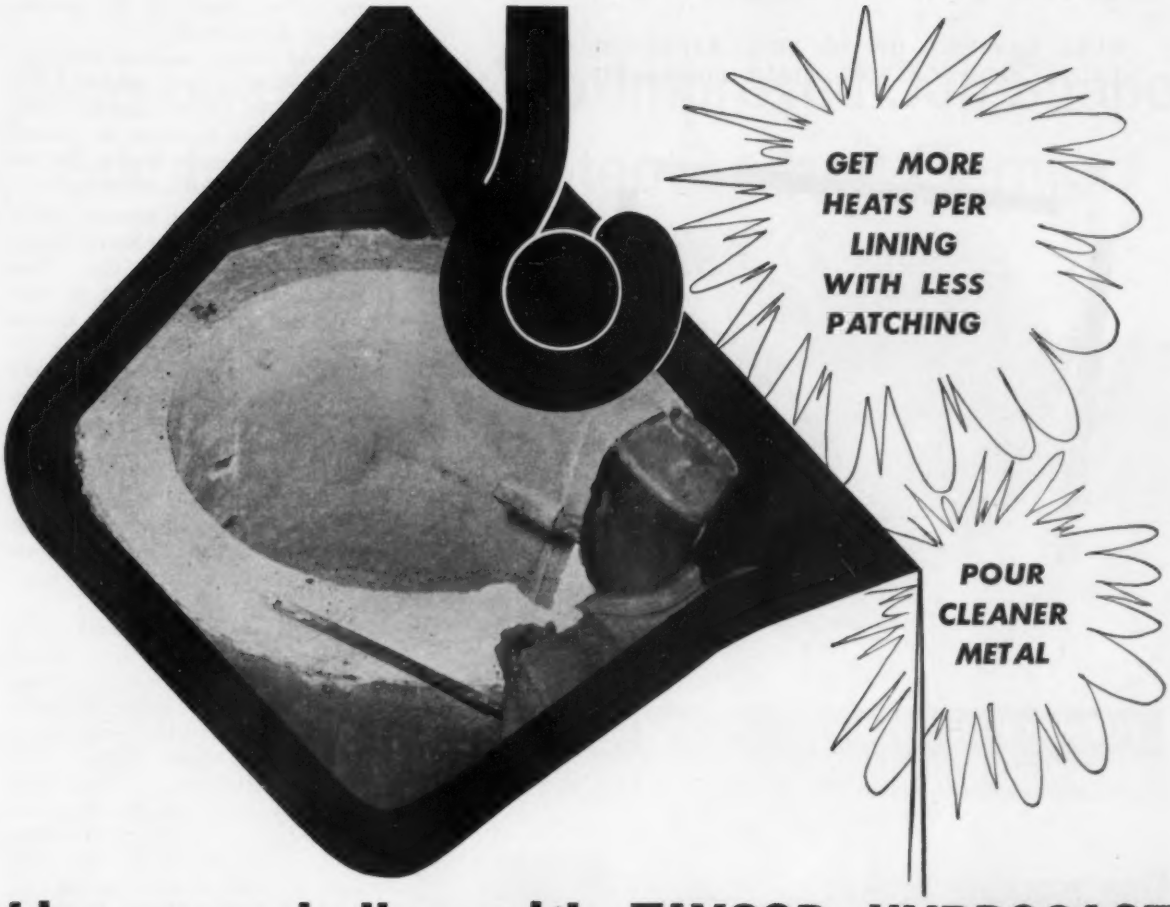
Silicon was found effective in increasing the critical temperature range and in raising the tempering response. Manganese, in amounts up to 1.10 per cent, decreased the critical temperatures, improved hardenability, and reduced tempering response. Extremely high tensile and yield strengths were attainable, with moderate ductility, by the proper selection of heat treating conditions, with only moderate silicon and manganese conditions.

A panel discussion of treatment and analysis versus final properties was presented by four speakers and was moderated by Charles F. Walton, technical director, Gray Iron Founders' Society.

Ralph A. Clark, Union Carbide Metals Co., Div. of Union Carbide Corp., Cleveland, discussed methods of making additions of magnesium and its effect on gray iron.

Howard H. Wilder, manager, Engineering Sales, Vanadium Corp. of America, Chicago, discussed post

Members of a panel which discussed "Treatment and Analysis vs Final Properties" included, left to right, Robert E. Savage, International Nickel Co.; Ralph A. Clark, Union Carbide Metals Co., division of Union Carbide Corp.; Howard H. Wilder, Vanadium Corp. of America; and David Matter, Ohio Ferro-Alloys Corp.



Line your ladles with TAYCOR HYDROCAST

Above: Installing TAYCOR 414 HYDROCAST in 1200 lb. ladle with the use of a concrete vibrator. Photo at left shows lining after being cast.

Iron and steel foundries in ever increasing numbers are standardizing on TAYCOR® 414 HYDROCAST® for ladle linings. These foundries report greatly increased lining life—less lining maintenance—improved quality of metal cast.

TAYCOR 414 is a corundum-base, high strength refractory castable for service to 3350°F. It contains 96% high purity alumina, sintered by a special process to give exceptionally low porosity. TAYCOR HYDROCAST has excellent resistance to erosion and metal penetration. Easily installed by pouring in place like concrete, ramming in forms; by pneumatic gun, or by trowelling.

Your savings are in the bag when you line your ladles with TAYCOR HYDROCAST. Write direct, or contact the Taylor field engineer in your area, for full details.

REFRACTORIES

The CHAS. TAYLOR SONS Co.

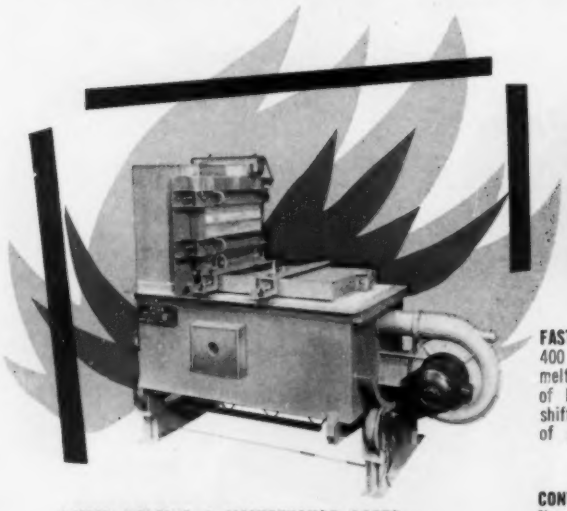
A Subsidiary of National Lead Company

REFRACTORIES SINCE 1864 — CINCINNATI, OHIO, U. S. A.

For More Information Circle 612, Page 87

SAVE $ WITH REDA FURNACES

FUEL SAVINGS UP TO 50% REPORTED
USING REDA GAS-OIL FIRED FURNACES!



BEST HEAT EFFICIENCY

FASTER MELTING — One 400 series Reda Furnace melts up to 11,000 lbs. of brass or bronze per shift, and up to 6,000 lbs. of gray iron per shift.

LOWER MELTING & MAINTENANCE COSTS — One man can operate a Reda Furnace . . . No daily repairs needed!

CONTINUOUS POURING — No waiting until floors, flasks, boards, etc. are filled with molds!

FURNACE DIVISION — WRITE TODAY FOR DESCRIPTIVE BULLETIN
REDA PUMP COMPANY - BARTLESVILLE, OKLAHOMA

For More Information Circle 613, Page 87

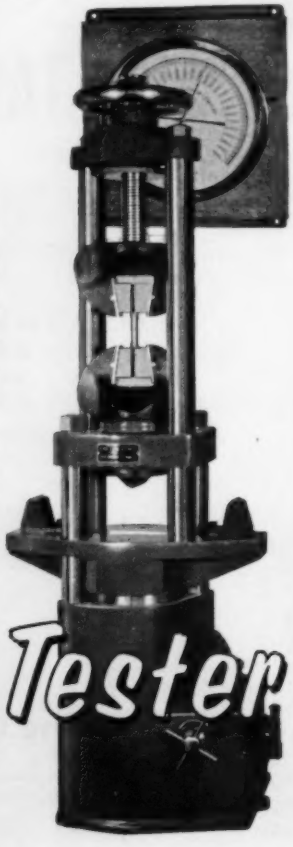
One machine makes these 3 strength tests:

■ TENSILE
■ TRANSVERSE
■ COMPRESSION

Answer your needs for tensile, transverse, and compression testing with our Universal Testing Machine. Specify the maximum load you require, anywhere from 100 to 40,000 lbs. Only two simple controls operate these hydraulically powered, automatic machines. Test results are instantly read from the load gauge.

Ask for catalog sheets and prices, or send us your requirements for a quotation as this testing machine can be modified in many ways.

Investigate the 'DETROIT' line of hardness testers, ductility testers, and tensile testers. Special testing machine requirements are welcomed.



Universal Tester

DETROIT TESTING MACHINE COMPANY
9382 Grinnell Avenue, Detroit 13, Michigan

For More Information Circle 614, Page 87

inoculation effects in the production of ductile iron.

David Matter, assistant vice president of sales and service, Ohio Ferro-Alloys Corp., Canton, Ohio, explained the functions of normal elements in ductile iron in the as-cast and annealed conditions.

Robert E. Savage, foundry industry manager, Primary Nickel Dept., International Nickel Co., New York, spoke on the effect of alloy additions on properties of ductile iron.

A review of ductile iron gating and risering practice was presented by Prof. John F. Wallace of Case Institute.

Prof. Dan K. Wright, Case Institute, in discussing casting design, stated that castings usually are over-designed, and that engineers welcome the assistance of foundries in designing.

Members of the Ductile Iron Committee of the Gray Iron Founders' Society include: Chairman, John W. Perry Jr., Grede Foundries Inc., Milwaukee; Charles A. Glenn, Lynchburg Foundry Co., Lynchburg, Va.; Hermann P. Good, Textile Machine Works, Reading, Pa.; Robert W. Jordan, Hamilton Foundry Inc., Hamilton, Ohio; Edward L. Roth, Motor Castings Co., West Allis, Wis.; George H. Tompkins, Black-Clawson Co., Hamilton, Ohio.

National Fluid Power Group Picks Officers and Directors

Officers for the coming year were elected by the National Fluid Power Association at its meeting at the Greenbrier, White Sulphur Springs, W. Va. The new officers are as follow: President, Wm. C. Richards Jr., Bellows-Valvair, Akron; first vice president, O. G. Lear, Sarasota Precision Products, Sarasota, Fla.; second vice president, Otto J. Maha, Hannifin Co., Des Plaines, Ill.; and treasurer, Wm. B. Kuhnke, Hanna Engineering Works, Chicago, Ill.

Newly elected directors for three-year terms are Harvey Sheffer, Sheffer Corp., Cincinnati; Ed Karns, Cessna Aircraft Co., Hutchinson, Kans.; and John E. Rowe, Tomkins - Johnson Co., Jackson, Mich. Barrett Rogers is executive vice president and secretary.

New Safety-Lock Tab • Improved Cup Shape Add Increased Protection and Comfort to AO Flexible Mask Goggles

Here are four improvements that make these new AO Vinylite Mask Goggles safer to use, more comfortable to wear:

1 New lock tab, with snap button, holds lens securely to frame at point of greatest stress, improves fit around entire frame. Lens will not pop out, but can be removed quickly and easily for cleaning or replacement.

2 New recessed slots at end of cup fit *over and around* temples of safety (or regular) glasses to keep entire cup edges in contact with face.

3 Increased eye cup depth gives additional coverage and protection at temples.

4 Improved flash around entire edge of mask molds to contours of face.

Lightweight, well-ventilated, extra-large face mask and .050" thick acetate lens assure the wearer of comfortable, optically correct, wide-angle vision while protecting entire eye area.

Your nearest AO Safety Products Representative now has this improved new model in impact goggles, chemical goggles, welding goggles, or chipping and grinding goggles, as well as two special models for maximum protection against chemical splash. Contact him today, or write for detailed folder, S-1229.

Your Surest Protection . . . AO SURE-GUARD GOGGLES

American Optical
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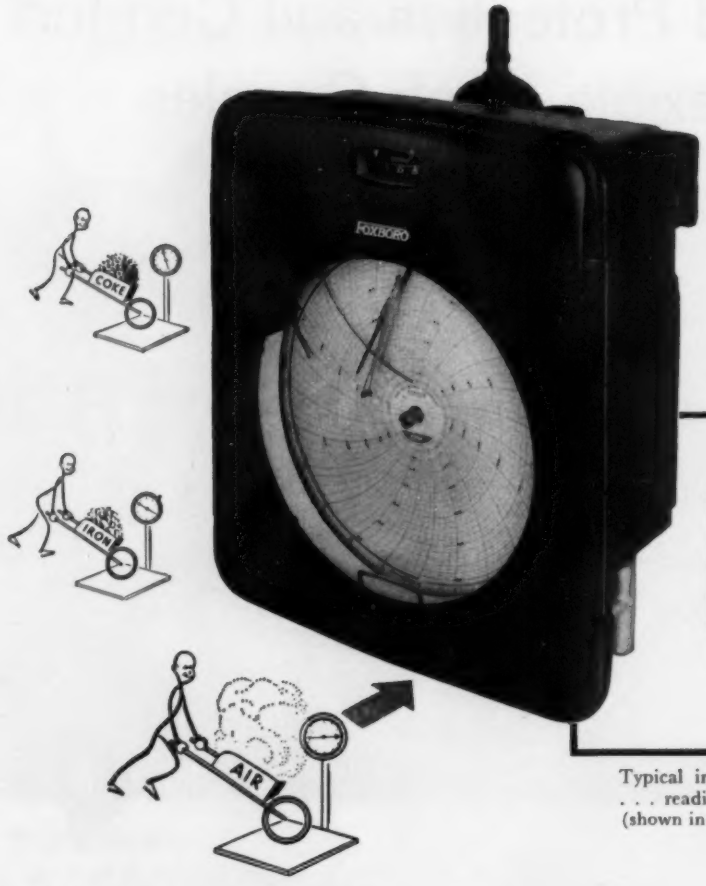
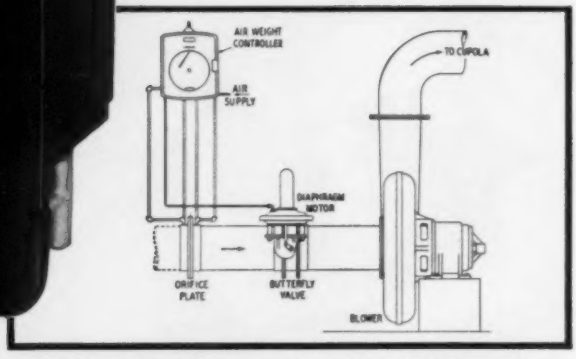
For More Information Circle 615, Page 87

Simplest Efficiency-Booster you ever saw!





Typical installation of Foxboro Air Weight Control . . . readily adaptable to either a centrifugal blower (shown in diagram) or a positive displacement blower.

Controlling cupola blast by **weight of air** cuts pigging, ups quality, gives uniform pours

There's no longer any need to let the weather upset your cupola operation. With a Foxboro Air Weight Controller you can get uniform pours, *every day*.

The Foxboro Air Weight Controller automatically and precisely controls cupola air blast by weight — delivers the correct amount of oxygen for the quantity of coke in the charge. Regardless of ups and downs in atmospheric pressure or temperature, this simple, inexpensive accessory compensates for every change — insures better combustion, more uniform heats, and saves pigging.

All you do is set the control pointer before you start the run. No further attention is necessary. Air weight is held constant as long as desired, or may be changed instantly for pours of different composition. Installation on your present blowers easily made by an experienced pipefitter.

Foxboro Air Weight Controllers are used by more than 1000 foundries. Write for Bulletin 10-10. The Foxboro Company, 328 Neponset Avenue, Foxboro, Massachusetts, U.S.A.

FOXBORO AIR-WEIGHT CONTROLLERS

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LITERATURE for Foundrymen

For More Information, Use Reader Service Card—Page 87

Gas-Fired Infra-Red Burners

Discussion of gas-fired infrared burners is contained in Bulletin H-19, with data on design features, dimension drawings, and detailed specifications.—**Eclipse Fuel Engineering Co.**, Combustion Div., Rockford, Ill.

For More Details Circle No. 401—Page 87

Cobalt-Base Alloy

Research report and papers contain data on structure of new cobalt-base alloy UMCo 50. Subjects featured are effect of additions, tensile strength, and properties. —**Cobalt Information Center, c/o Battelle Memorial Institute**, 505 King Ave., Columbus 1, Ohio.

For More Details Circle No. 402—Page 87

Thermocouple Wire

Bulletin 1-500 is a catalog of 12 pages featuring thermocouple wire and accessories for any type of application.—**Claud S. Gordon Co.**, 3000 S. Wallace St., Chicago 16, Ill.

For More Details Circle No. 403—Page 87

Blast Cleaning Parts

Replacement parts for blast cleaning equipment are featured in two leaflets.—**Benfur Engineering Co.**, 143 Katherine N. E., P. O. Box CR 854, Grand Rapids 5, Mich.

For More Details Circle No. 404—Page 87

Sling Chains

Catalog DH-39-B describes and illustrates components of sling chains. Included is chart showing working load limits of the chains for various angles.—**American Chain & Cable Co., Inc., American Chain Div.**, York, Pa.

For More Details Circle No. 405—Page 87

Testing Sieves

Bulletin F-S-61 contains technical and specifications data on testing sieves, including new 1961 ASTM, NBS, and ASA sieve standards.—**Newark Wire Cloth Co.**, 351 Verona Ave., Newark 4, N. J.

For More Details Circle No. 406—Page 87

Four Wheel Drive Loaders

Catalog lists specifications and application information for three models of four-wheel drive loaders.—**J. I. Case Co.**, Racine, Wis.

For More Details Circle No. 407—Page 87

Programming Aid

Brochure provides details of efficient assembly system automatic programming aid for company's 400 electronic data processing system. It gives techniques for incorporating tested problem solutions into a program.—**Minneapolis-Honeywell, Electronic Data Processing Div.**, 60 Walnut St., Wellesley Hills 81, Mass.

For More Details Circle No. 408—Page 87

Conveyor Systems

Literature illustrates and describes electric, gravity, electronic, hydraulic, and pneumatic conveyor systems.—**Logan Conveyors**, 200 Cabel St., Louisville 6, Ky.

For More Details Circle No. 409—Page 87

Dies and Molds

Brochure covers company's line of dies and molds. Machinability, hardenability, castability, and economy are covered.—**Meehanite Metal Corp.**, 714 North Ave., New Rochelle, N. Y.

For More Details Circle No. 410—Page 87

Foundry Flasks

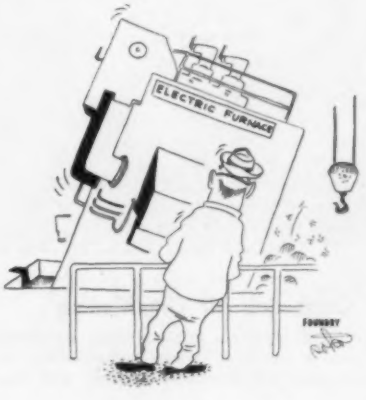
Catalog 76 discusses features of company's slip-type flask, the Slipster. Ball and cam, split cam, floating cam, and shielded spring devices are shown.—**Sterling National Industries Inc.**, Milwaukee 14, Wis.

For More Details Circle No. 411—Page 87

Fatigue Testing Machine

Twelve-page bulletin, RF-2-61, describes hydraulically actuated fatigue testing machines capable of testing material specimens and complete structural components. They also can be used for static testing. —**Riehle Testing Machines Div., American Machine and Metals Inc.**, East Moline, Ill.

For More Details Circle No. 412—Page 87



Immersion Thermocouple

Form tells of expendable immersion thermocouple for measurement of steel temperatures in open hearth and electric furnaces and for measurement of temperatures of other molten metals.—**Engelhard Industries Inc., Instruments & Systems Div.**, 850 Passaic Ave., East Newark, N. J.

For More Details Circle No. 413—Page 87

Pre-Engineered Metal Buildings

Brochure BD-2602 illustrates and describes series of pre-engineered metal buildings. Specifications and structural and assembly features are listed.—**Building Div., Parkersburg Rig & Reel Co.**, Parkersburg, W. Va.

For More Details Circle No. 414—Page 87

Insulating Firebrick

Bulletin R-38 discusses advantages of insulating firebrick. It provides basic application and selection data in illustrated form.—**Babcock & Wilcox Co., Refractories Div.**, 161 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 415—Page 87

Motor Couplings

Six-page Folder 2975, "Type MC Geared Flexible Motor Couplings," presents pertinent data on company's line of motor couplings.—**Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 416—Page 87

Soft Steel Gaggers

Data sheet lists sizes and shapes of soft steel gaggers available. Specifications show diameters and lengths of heel, leg, and toe.—**Wadsworth Equipment Co.**, P. O. Box 6122, Ellet Station, Akron 12, Ohio.

For More Details Circle No. 417—Page 87

Abrasive Cloth Wheel

Technical data sheet FD-30 discusses a super-resilient abrasive cloth wheel. Grit grades, rotation speeds, and abrasive loading procedures are described.—**Merit Products Inc.**, 3691 Lenawee Ave., Los Angeles 16, Calif.

For More Details Circle No. 418—Page 87

Motion Safety Switch

Bulletin MS-3 describes an improved type of motion safety switch for protecting machines, equipment, and processes against damage resulting from stoppage or reduced speed. Design and operating details, typical applications, and

illustrations are provided.—**Fuller Co.**, Catasauqua, Pa.

For More Details Circle No. 419—Page 87

Bronze Alloy

Four-page sheet contains information about NDZ high strength dezincification and dealuminization resistant valve stem material and its characteristics.—**R. Lavin & Sons Inc.**, 3426 So. Kedzie Ave., Chicago 23, Ill.

For More Details Circle No. 420—Page 87

Proximity Limit Switch

Bulletin describes proximity limit switch and suggests applications valuable to foundrymen such as on jolt machines and sand hoppers.—**General Equipment & Mfg. Co.**, 116-120 S. Campbell, Louisville 6, Ky.

For More Details Circle No. 421—Page 87

Motor Application Guide

1961 Motor Application Guide Bulletin 010 discusses company's line of single-phase, three-phase, and direct-current motors. Gearmotors, selective speed drives, and motor selection charts are included.—**Century Electric Co.**, St. Louis 66, Mo.

For More Details Circle No. 422—Page 87

Ball Bearing Idlers

Bulletin 456-10 discusses ball-bearing belt conveyor rolls, troughing, and return idlers. Charted information on dimensions and weights also is given.—**Webster Mfg. Inc.**, Tiffin, Ohio.

For More Details Circle No. 423—Page 87

Rubberized Abrasives

Manual supplies application data and actual case histories of typical applications of rubberized abrasives. It outlines efficient methods for mounting, dressing, and truing.—**Cratex Mfg. Co. Inc.**, 1600 Rollins Rd., Burlingame, Calif.

For More Details Circle No. 424—Page 87

Power Cylinder Accessories

Reference bulletin provides a method for quick identification and selection of mounting accessories for square-type hydraulic and pneumatic power cylinders.—**Hannifin Co.**, Dept. 238, 501 S. Wolf Rd., Des Plaines, Ill.

For More Details Circle No. 425—Page 87

Takeups

Book 2741 lists 320 different takeup units and gives descriptions and dimensional data for each frame. Types include babbitted bearing, ball bearing, roller bearing, spring, and gravity takeups.—**Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 426—Page 87

Gas-Powered Lift Trucks

Information on gas-powered lift trucks is offered in 16-page bulletin called "Facts and Factors Booklet about Gas-Powered Lift Trucks." Application photographs and basic specification and dimension tables are included.—**Automatic Transportation Co.**, 149 W. 87th St., Chicago, Ill.

For More Details Circle No. 427—Page 87

Chaplet Information

Wall Chart in color illustrates and describes commonly used chaplets. Complete sizing information is provided also.—**Fanner Mfg. Co.**, Brookside Park, Cleveland 9, Ohio.

For More Details Circle No. 428—Page 87

Portable Potentiometer Indicator

Revised illustrated Catalog 64-1 describes portable potentiometer indicator. Construction details and application and maintenance information are provided.—**Thermo Electric Co. Inc.**, Saddle Brook, N. J.

For More Details Circle No. 429—Page 87

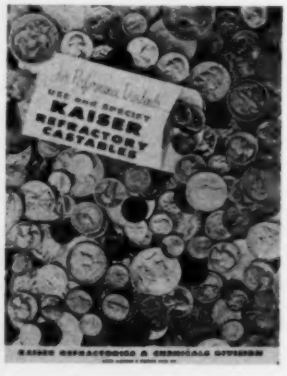
Conveyor Applications

Four-page brochure, "Conveyorama of Cost-Cutting Ideas," contains pictures and descriptions of recent conveyor installations. — **Standard Conveyor Co.**, North St. Paul 9, Minn.

For More Details Circle No. 430—Page 87

Castable Refractories

Booklet of 24 pages describes physical characteristics and applications of a variety of castable refractories for use in furnaces which operate at temperatures from 700 to 3500° F.—**Kaiser Refractories & Chemicals Div., Kaiser Aluminum & Chemical Sales Inc.**, 300 Lakeside Dr., Oakland 12, Calif.



For More Details Circle No. 431—Page 87

Venturi Valves

Pamphlet contains information about venturi valves for use with all liquids, gases, industry and marine applications, and rockets and nuclear equipment.—**Fox Valve Development Co. Inc.**, 36 Brentwood Dr., Verona, N. J.

For More Details Circle No. 432—Page 87

Crane Cab Air Conditioning

Ceiling, floor, and seat-type air conditioners are described in Bulletin 2001, including self-contained systems and condensers. Diagram shows split system installation.—**Correct-Air Corp.**, Willoughby, Ohio.

For More Details Circle No. 433—Page 87

Equipment Leasing

"The Engineered Equipment Lease" is an illustrated 16-page brochure explaining the facts about the leasing of new and used equipment and other, related subjects.—**United States Leasing Corp.**, 580 California St., San Francisco 4, Calif.

For More Details Circle No. 434—Page 87

Melting Furnaces

Six-page leaflet describes company's line of melting furnaces and their applications. —**Monometer Mfg. Co. Ltd.**, "Savoy House," 115-116 Strand, London, W.C. 2, England.

For More Details Circle No. 435—Page 87

Magnetic Pulleys

Bulletin PY-260 covers permanent magnetic pulleys; lists their advantages; gives operating principles; and provides engineering data.—**Homer Mfg. Div., Ohio Electric Mfg. Co.**, Lima, Ohio.

For More Details Circle No. 436—Page 87

Aluminum Flux

Form presents introduction of aluminum flux G-61 and provides instructions for use. It also describes the company's cupola fluxes.—**Cleveland Flux Co.**, 1026-1036 Main St., N.W., Cleveland 13, Ohio.

For More Details Circle No. 437—Page 87

Compressor Valves

Booklet 3222 answers questions about operation and importance of valves. It traces evolution of valving from 19th century to present.—**Ingersoll-Rand Co.**, 11 Broadway, New York 4, N. Y.

For More Details Circle No. 438—Page 87

Casting Information

Brochure tells how company's line of aluminum master alloys, special alloys, and fluxes produce quality castings.—**Niagara Falls Smelting & Refining Div., Continental Copper & Steel Industries Inc.**, 2204-2214 Elmwood Ave., Buffalo 23, N. Y.

For More Details Circle No. 439—Page 87

Testing Machines

Bulletin G-361 covers the company's line of equipment, including testers for ductility, tensile strength, compression, and various other special tests.—**Steel City Testing Machines Inc.**, 8817 Lyndon Ave., Detroit 38, Mich.

For More Details Circle No. 440—Page 87

Variable Speed Drives

Illustrated catalog features "lube-free" integral and fractional horsepower variable speed drives. Modifications, accessories, dimensions, and technical information also are listed.—**Sterling Electric Motors Inc.**, 5401 Telegraph Rd., Los Angeles 22, Calif.

For More Details Circle No. 441—Page 87

YOUR KEY to Better, Cleaner Brass Castings...

Famous CORNELL
BRONZE & BRASS FLUX

- Cleanses molten brass whether red or yellow even when the dirtiest brass turnings or sweepings are used.
- Longer crucible life — no metal loss.
- Forms a perfect covering over the metal during melting, prevents oxidation and reduces obnoxious gases to a great extent.
- Write or call for full information.

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Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes . . . Since 1918

FAMOUS CORNELL FLUXES

For More Information Circle 617, Page 87

Left to right at the speakers table are IBF officers N. P. Newman, treasurer; D. A. Richards, incoming president; G. R. Shotton, outgoing president; George Lambert, secretary; and G. R. Webster, senior vice president

Cheltenham Site of 48th

British Foundry Conference

By M. M. HALLETT
Managing Director
Chamberlin & Hill Ltd., Walsall, England
European Editor, Foundry

● THE PLEASANT countryside of West England and sunny weather gave friendly greeting to the many who attended the 58th annual conference of the Institute of British Foundrymen at Cheltenham, May 15-18.

At the business session, G. R. Shotton handed over the presidency to D. A. Richards, G. R. Webster was promoted from junior vice president to senior vice president, and R. F. Horton, Sheffield Branch, was elected to junior vice president.

Treasurer N. P. Newman presented a satisfactory balance sheet, and M. M. Hallett, supported by D. V. Atterton, indicated the virile condition of the Technical Council. They called attention to the revised edition of the *Atlas of Defects in Castings*, which has just been republished in a revised, enlarged, and improved form.

Awards—Two past presidents of long standing, S. H. Russell and J. J. Sheehan, were elected to honorary membership. The E. J. Fox Medal was presented to J. E. V. Jobson in recognition of his outstanding contributions to the progress of the foundry industry. As head of Qualcast Ltd., Mr. Jobson built up one of the largest and most renowned foundry groups in the country and set an outstanding example of leadership for the rest of the foundry industry.

The Oliver Stubbs Medal was presented to Jack Hill, Ley's Malleable Castings Co., for his contributions to foundry practice in many papers presented to the institute and for his work in the field of foundry education. The Meritorious Services Medal went to J. H. Pearce for many years of work as secretary of Sheffield Branch and on committees.

The British Foundry Medal and Prize for the best paper printed in *The British Foundryman* in 1960 went to J. M. Middleton and P. J. McIlroy, British Steel Castings Research Association, for their paper "Mold Paints and Washes for Steel Foundry Use." Diplomas for individual papers were presented to B. R. Douglas, South Wales Branch; H. A. Stephens, Victoria (Australia) Branch; and R. V. Riley, Sheffield Branch.

Five members were elected to council by national ballot. They included H. T. Angus, N. C. Charlton, M. M. Hallett, H. P. Millar, and A. P. Riley,

Presidential Address—In his presidential address, D. A. Richards drew attention to the essential importance of castings in the national economy and reviewed the various activities of the institute in disseminating the technical information needed to produce castings to present day standards.

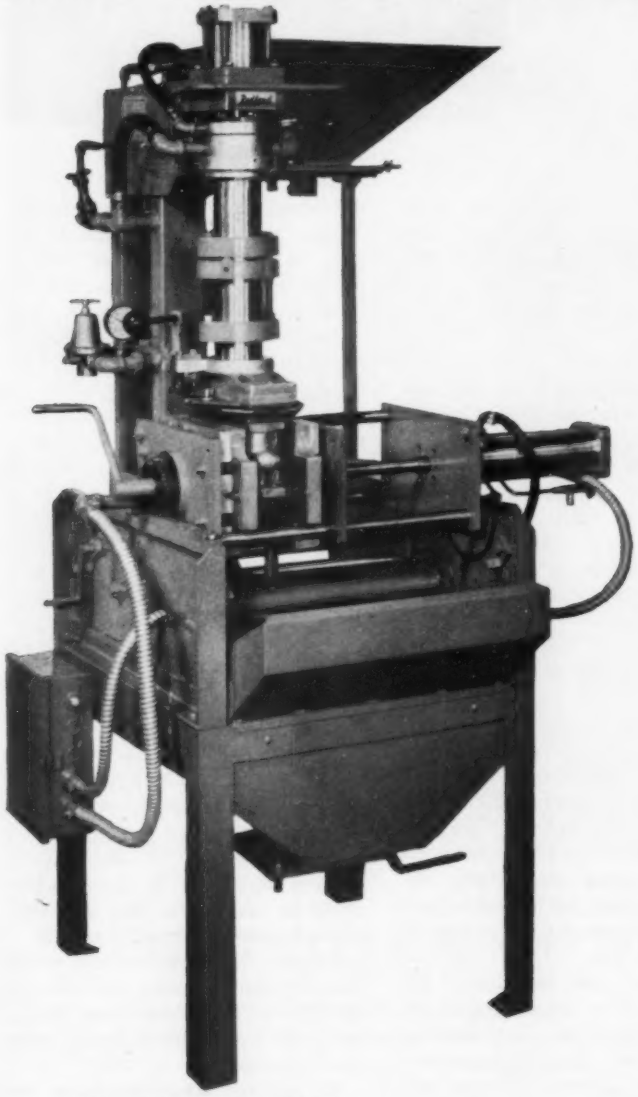
He urged younger members of the institute to be active in the local branches, read the institute's journal, and take advantage of the educational facilities offered by foremen's courses and the institute's connections with the National Foundry Craft Training Centre and the National Foundry College. He also referred to the discussions taking place with the Ministry of Education on the establishment of national examinations in foundry technology and paid tribute to the invaluable work of Past President Shotton in this respect.

The Edward Williams lecture was given by N. P. Newman, who discussed leadership in industry. The speaker emphasized the personal nature of leadership and the importance of example. Leadership by fear or dictatorship is dead, he said, and weak leadership is responsible for most labor troubles. The leader has to develop the best qualities in all employees.

The technique of leadership is to instill a general discipline in an organization so that all its members are aware of the objectives to be

Redford

MODEL HP-4
SHELL CORE BLOWER



A very fast low cost machine that is setting new standards in the production of small shell cores. The quality of intricate shell cores is improved because sand is blown into core box cavities through unrestricted blow holes. A novel cradle-type core box clamp is used to invert the core box and at the same time bring the core box within easy reach of the operator for core removal. There is no out of balance weight to struggle with. The machine can handle core boxes up to 10" x 10" in size. Shell cores may weigh up to 4 lbs., before draining.

The HP-4 Redford has ample blow capacity and can also be used to blow Furfural resin sand mixes into heated core boxes.

Price F.O.B. Detroit—$1,200.00
For complete information write for Bulletin HP-4

. . Above cores illustrate the variety of work that can be done with the Redford HP-4 Core Blower.

REDFORD IRON & EQUIPMENT CO.
20733 Glendale - Detroit 23, Mich.
Phone: KEnwood 1-8611

attained and each person knows his responsibility in achieving those objectives. Instructions must be definite and clear, and they must be cancelled without hesitation if they are found to be wrong. All employees should have a personal sense of participation, and everyone should be subject to the highest moral authority.

The leader achieves these ends largely by setting an example and proving its quality by such virtues as serenity, dignity, tolerance, integrity, enthusiasm, courage, and determination coupled with sincerity and humility.

The technical sessions were organized generally into groups of common interest. The first dealt with the soundness of castings—particularly iron castings. Technical subcommittee 49 reported on a long and extensive investigation to evaluate feeding heads and feeding aids.

J. E. V. Jobson received the E. J. Fox Medal in recognition for his outstanding contributions to the foundry industry

R. F. HORTON
Junior Vice President

Data on Feeding—Chairman A. Tipper said that to produce sensibly comparable results, the subcommittee had studied the feeding of simple shapes in most foundry metals, the shapes often being 4 and 6-in. cubes or flat slabs 6 x 6 in. by 1¾ in. thick. Heights and diameters of the feeders, methods of pouring, hardness of molds, and the use of exothermic materials were studied.

It was found that when phosphorus content of the iron exceeded 0.75 per cent, it was not possible to cast sound 4 or 6-in. cubes by straightforward top feeding. The 1¾-in. slabs could be cast sound in this material, but not 2 in. thick slabs. On lower phosphorus cast irons, it was found that the diameter of the feeder is more important than the height. It also was found that the use of hard molds such as those produced by the CO_2 process is most helpful and that when exothermic heads are used, insulating covers should be provided, too.

On steel it was found that the optimum height/diameter ratio on cylindrical feeders should be 1.5/1.0 with normal feeders and 0.5/1.0 with exothermic feeders. On copper-base alloys, severe chilling is of great importance, but exothermic feeding can be useful on chunky castings.

These considerations, together with those noted on aluminium alloys and on blackheart malleable iron, showed that for skin-forming alloys, the atmospheric pressure should be maintained together with a definite temperature gradient. Direct running into top feeders is generally satisfactory and gives a good yield.

The report also introduced the conception of a factor called the K ratio. Chvorinov has demonstrated the well known importance of the ratio between volume and surface area of a casting. The K ratio is the relation between volume/surface area ratio of the casting and volume/surface area of the feeder and is used as an indication of feeding efficiency.

In the discussion, the reason for choosing the cube, with its strong corner effect, was questioned, as was the meaning of the K ratio. Mr. Tipper replied that although the cube is difficult to treat mathematically, it represents a definite type of casting. The K ratio is a convenient factor for investigatory work, even though not applicable on the foundry floor.

It also was pointed out that iron castings, particularly high phosphorus iron castings, usually should not be fed to produce results. It is far more important to use a rigid mold at a low pouring temperature, preferably avoiding temperature gradients and using pencil gating.

High Phosphorus Iron—R. V. Riley, in a discussion of phosphoric cast iron, pointed out that a substantial proportion of the world's pig iron is high in phosphorus. This element increases fluidity, raises tensile strength, and improves wear resistance of cast iron, but reduces its shock resistance.

In ductile iron it also greatly reduces ductility. If ductile iron could be cast white, then annealed, the phosphides would assume a spheroidal form, and the iron would have the same tensile strength and ductility as low phosphorus ductile, but also would have much worse shock resistance.

In the discussion, emphasis was laid on the fact that although the brittleness due to phosphorus often may not be vital, the need for sound castings invariably is necessary. Since phosphorus is bad for soundness, appropriate techniques such as rigid molds must be used. Phosphorus is not essential for the production of good surface finish, but

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Mold Stability—A British Cast Iron Research Association paper dealt with mold stability in relation to soundness. A. D. Morgan and J. M. Greenhill pointed out that when iron enters a green sand mold, the mold dilates under the pressure, and the iron needed to fill the larger mold cavity leads to excessive shrinkage in the casting.

Much work has shown the importance of rigid molds in preventing dilation and providing sound castings. The authors gave numerous practical examples. In cylinder heads and in commercial vehicle brake drums, for example, there is an exact correlation between weight of finished casting and soundness, the lightest castings (made in unswollen molds) being sound. With ramming to produce uniformly hard molds without any ramoff, the drums were always sound.

Large, hollow roll castings showed unsoundness due to collapse of an unduly thick layer of straw around the core barrel. When the thickness of the straw was reduced, sound castings were obtained. Unsoundness in valve bodies was eliminated by use of molds faced with CO_2 treated sodium silicate-bonded sand. In a crankshaft, parts of castings were too close to the flask. This condition led to progressive heating up and bulging of the box, with consequent dilation of the mold cavity and unsoundness in the castings.

In the discussion, it was emphasized that it is not always necessary to go to special molding materials since hard green sand molds can be made if properly controlled. The discussion also brought out the desirability of selling castings per unit and not by weight.

Maintenance Problems—Plant maintenance was discussed by R. E. J. Roberts in a paper which gave a number of examples of failure of equipment due to poor design. Cupola hoist limit switches needed protection against heat and mechanical damages, as did hoist brakes. Sand elevator pulleys made by fabrication collapsed from fatigue due to inferior welding, and it was difficult to secure access for inspection. Electrical failures often are due to fine dust, and it was found that a cure for trouble in control panel rooms is to pressurize them slightly.

It was suggested that the cost of maintenance wages and materials in a fully mechanized plant is between 7½ and 10 per cent of the total cost of production. In a unit-mechanized plant, the ratio is 4½ to 7½ per cent, and in jobbing work it is 3 to 6 per cent. The paper discussed the type of maintenance engineer to be employed and the complexity of control systems in relation to making them work effectively.

During the discussion, the author indicated that maintenance engineers are paid a flat rate rather than by an incentive plan, particularly since most breakdowns are the fault of operators, not of maintenance men.

Iron Foundry Planning—Some considerations in planning a general iron foundry were discussed by E. Longden, who put forward two specific examples, both depending on sandslingers. One was for a foundry to produce 150-200 tons per week and the other for a foundry to produce 250-300 tons per week. Special attention was given to molding pits and dressing operations. Responsibility of staff members also was covered.

The discussion dealt with the training and experience of methods engineers and the desirability of continuous technical contact between technologists and craftsmen in the foundry. It was suggested that one way to deal with the problem of dust extraction from molding pits is to do as much as possible of the knockout at night. The speaker's staff organization plan was criticized on the grounds that 13 individual men were directly responsible to the foundry manager.

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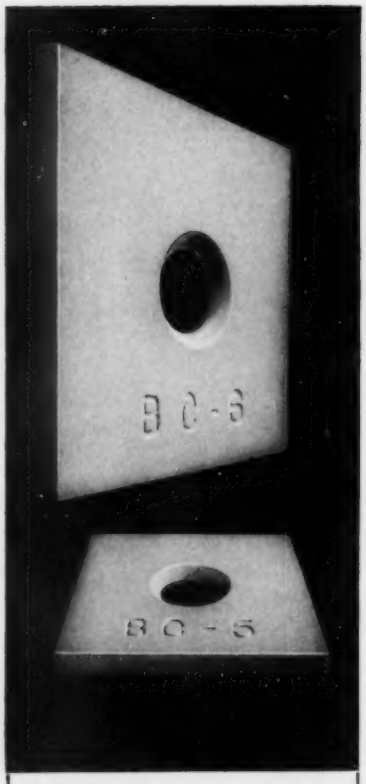
Melting Developments—Another long and detailed report from a technical subcommittee was presented by its chairman, R. J. Sarjant. Its subject was developments in melting metals for foundries. This review covered iron, steel, and nonferrous metals and melting units including cupolas of all types, rotary and air furnaces, and crucible furnaces fired with solid fuel, oil, gas, and electricity. Future changes were thought likely to be gradual rather than sudden and to depend on movements in the relative prices of coke and electricity or on the development of a really cheap gas. The convenience of oil will insure its continued use in some fields.

There is a general trend toward electric melting and, for iron, toward hot blast cupolas. In the presentation, it was pointed out that most melting furnaces work at a melting rate less than that of maximum efficiency, whereas most steam boilers are fired at a rate greater than that of maximum efficiency.

The discussion dealt with long-term ideas such as use of refractories other than silica, recirculation of hot waste gases, and regeneration of oxygen. The process of flash melting of a small quantity of metal was mentioned, but some doubt was expressed whether the highest quality of liquid metal always coincided with the highest melting efficiency.

The difficulty of making use of waste heat from melting operations on account of its intermittent availability was indicated, and attention again was drawn to the potential of total gasification of coal coupled with oil enrichment.

Heat Treating Cast Irons—The first part of a paper by W. M. Lord dealt with the metallurgy of the heat treatment of gray and ductile iron in terms of stress relief, normalizing, annealing, quenching, and tempering. The second part of the paper described a large, bogie-type, gas-fired heat treatment furnace with a high degree of automatic control and elaborate instrumentation designed to work accurately over a temperature range from 750 to 1850° F. The equipment included



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In the discussion, more details of the heat treatment of spheroidal graphite iron were considered in relation to the formation of substructures and the possible presence of carbide-forming elements. The formation of internal stresses during interrupted heat treatment was considered, and the discussion concluded with comments on the relative merits of stress relief heat treatment and weathering.

Impact Testing of Cast Iron—G. N. J. Gilbert, British Cast Iron Research Foundation, presented a clear account of impact testing of cast iron and the reasons for its use. Both ductile and malleable iron may fail in either a brittle or a ductile manner according to the temperature. At some critical temperature, the failure changes rapidly from one type to the other. Therefore, whether the material is brittle or not at room temperature depends on whether the temperature of change is above or below room temperature. The paper showed how the temperature of this change is influenced by silicon, manganese, and phosphorus contents; by microstructure; and by heat treatment.

Flake graphite iron always fails in a brittle fashion. The impact test piece could, therefore, be unnotched. Some useful information was provided by determining the work done to fracture (resilience). The paper showed how the weight and velocity of the hammer in the Charpy test influences results.

Discussion revealed that the work done to fracture could be determined with rather more trouble but very accurately by autographic recording of a tensile test on a ring specimen. The old transverse test gave some useful information, but was not very accurate. It was agreed that impact tests generally are of more importance from the research angle than for information they give to either the foundry or the designer. Factors which increase the proof stress tend to raise the temperature of transition from ductile to brittle conditions, except that a small grain size is beneficial to both properties.

Trace Elements—The influence of trace elements is of increasing importance in many types of cast iron, and R. H. T. Dixon presented a research paper regarding the elimination of oxidizable trace elements by blowing the melt with air or oxygen or oxygen coupled with vibration. Curves and tables gave detailed results on many elements. Vibration assisted elimination, but not to a major extent. Of the relatively common elements, copper, cobalt, and nickel were not removed by such treatments, and arsenic, tin, and antimony were difficult to remove. Most other elements could be eliminated.

Discussion centered around such problems as relative rates of removal of elements, the part played by slag, obtaining representative samples for analysis, temperature changes during treatment, and the use of nitrogen to inject certain oxidizable elements such as magnesium into a molten bath.

Properties of Gunmetals—J. E. Stolarczyk, in a paper entitled "The Structure and Properties of Sand-Cast Gunmetals," described the large amount of experimental work carried out in a systematic survey of the properties of the alloys in relation to composition, covering a range up to 18 per cent zinc, 14 per cent tin, and 7 per cent lead. Melts were either degassed or deliberately gassed and poured at various temperatures into a variety of castings designed to reveal porosity and variations in strength with section.

The tendency of castings with equiaxed columnar structures to have better properties than castings with equiaxed structures was generally confirmed. Porosity increased sharply when combined tin and zinc content exceeded 12-15 per cent in light sections or about 10 per cent in heavy sections. Porosity was reduced by casting into molds lined with thin sheet steel to prevent metal-mold reaction.

At least 3 per cent lead was needed to give pressure tightness. From 8-10 per cent tin appeared to be an optimum content both for tensile strength and for elongation, but creep strength was favored by high zinc rather than by high tin. No marked differences in resistance to corrosion by jet impingement in sea water were noted with any of the main alloys studied. The in-

vestigation confirmed the general usefulness of the well known 85-5-5-5 alloy.

Impurities in Gunmetals — The influence of bismuth, iron, arsenic, and antimony in sandcast gunmetals was described by J. E. Stolarczyk, D. A. Hudson, and D. Ashbolt in relation to both 88-10-2 and 85-5-5-5 gunmetals. Once again columnar structure was associated with the best mechanical properties and a coarse, equiaxed structure with the worst properties. In phosphorus-free melts, iron above a level of about 0.15-0.2 per cent was preferentially oxidized.

The permissible maximums for the various elements were discussed in the light of revision of British Standards. It was concluded that to limit reduction in tensile strength to not more than 0.5 tons per square inch or elongation to not more than 5 per cent, iron content in 88-10-2 should not exceed 0.15 per cent, bismuth 0.02 per cent, arsenic 0.1 per cent, and antimony 0.1 per cent. In 85-5-5-5 alloy, corresponding limits should be 0.15, 0.05, 0.2, and 0.1 per cent respectively.

Doubling impurity levels would lead to about double the loss in properties. As a general rule, the total impurities (except lead) in 88-10-2 can be restricted to 0.2 per cent (provided that bismuth is not greater than 0.03 per cent), and in 85-5-5-5 the total impurities can be restricted to 0.5 per cent (keeping bismuth not greater than 0.05-0.1 per cent).

Gunmetal Castings—A paper by F. Hudson on the effects of metal-mold reaction and section thickness on the properties of gunmetal was notable for the use of tensile test bars 36 in. long with a 4-in.-diam parallel portion machined to 3¾-in. diam and tested in a 1000-ton tensile testing machine.

Metal-mold reaction was very important in these large bars, even 0.02-0.04 per cent phosphorus being sufficient to initiate some reaction in bars cast in dry sand molds baked for 24 hours at 750° F. Higher phosphorus contents induced severe reaction and lowered strength by one-third and ductility by two-thirds.

Sound bars with more than 7 per cent tin and less than 3 per cent lead had the same properties in heavy as in light sections, but in the 85-5-5-5 type, mechanical properties always were reduced severely in heavy sections because of lead segregation at the grain boundaries. This was prevented by an addition of 2 per cent nickel. An alloy with 6-7 per cent tin, 3-5 per cent lead, 3-5 per cent zinc, and 1½-2½ per cent nickel combined the high strength of 88-10-2 with the pressure tightness of 85-5-5-5.

Permanent Molding—Gravity die-casting (permanent mold casting) in a general foundry was described by D. Redfern and I. E. Brown, who gave details of their practice in producing castings for such applications as motor scooters. Composite dies were used to make similar models in two versions. Metal pouring temperatures were adjusted at the beginning of the run to match increased die temperatures. On smaller castings, collapsible metal cores were used with a three-piece construction and a withdrawable center with a wedge action.

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was mainly one with 5 per cent silicon, 1.2 per cent copper, and 0.5 per cent magnesium, cast with grain refinement and degassing and used in the fully heat treated condition.

Diecasting Machines—E. Gaspar and M. G. Munns discussed developments in (pressure) diecasting machinery for aluminum. Speed and pressure requirements during injection were analyzed, and emphasis was laid on the importance of high speed of movement of the piston during filling and rapid build-up of pressure during the final stages.

Recent developments incorporated a short-stroke hydraulic cylinder to compensate for temperature changes leading to variations in die thickness. There is a general trend towards automatic controls. Temperature control can be extended to individual areas of the same die.

Vacuum Diecasting—The officially sponsored paper from the American Foundrymen's Society was by F. C. Bennett, Dow Metal Products Co., who discussed what to expect from vacuum diecasting. Contrary to expectation, the mechanical properties of vacuum diecast parts are only about 5 per cent better than those of conventionally diecast parts. The use of a vacuum is safe, however, and assists easy and efficient feeding of metal from the reservoir. The castings are free from gas porosity and, therefore, no blistering develops during subsequent welding or other surface treatments. The castings have a better surface finish and suffer less from oxidation (especially important in magnesium alloys), but the extra cost and complexity of the process is considered to make it applicable to only 5-10 per cent of all castings.

Vacuum Investment Casting—The use of vacuum for the investment casting of nickel-base alloys was discussed by D. F. B. Tedds. He pointed out that the complex nickel-chromium-titanium alloys with additions of cobalt or molybdenum or tungsten which are needed to meet the demands of high stresses and temperatures associated with modern gas turbines are becoming less and less forgeable. There is, therefore, an increasing tendency to use castings, which have to meet the highest standards of reliability. The mold usually is a shell built up by investing a refractory slurry around wax patterns.

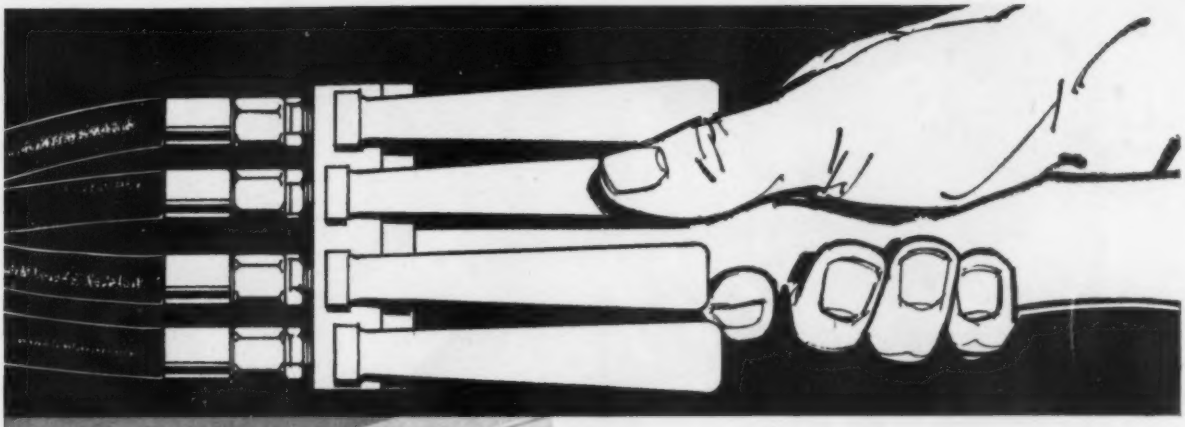
Elaborate inspection procedures involve surface quality tests, complete x-ray examination, and grain size determinations by 100 per cent etching. Vacuum casting does not notably improve many mechanical properties, but it greatly increases regularity and reliability so that vital highly stressed items such as gas turbine rotor blades now are produced regularly by vacuum casting.

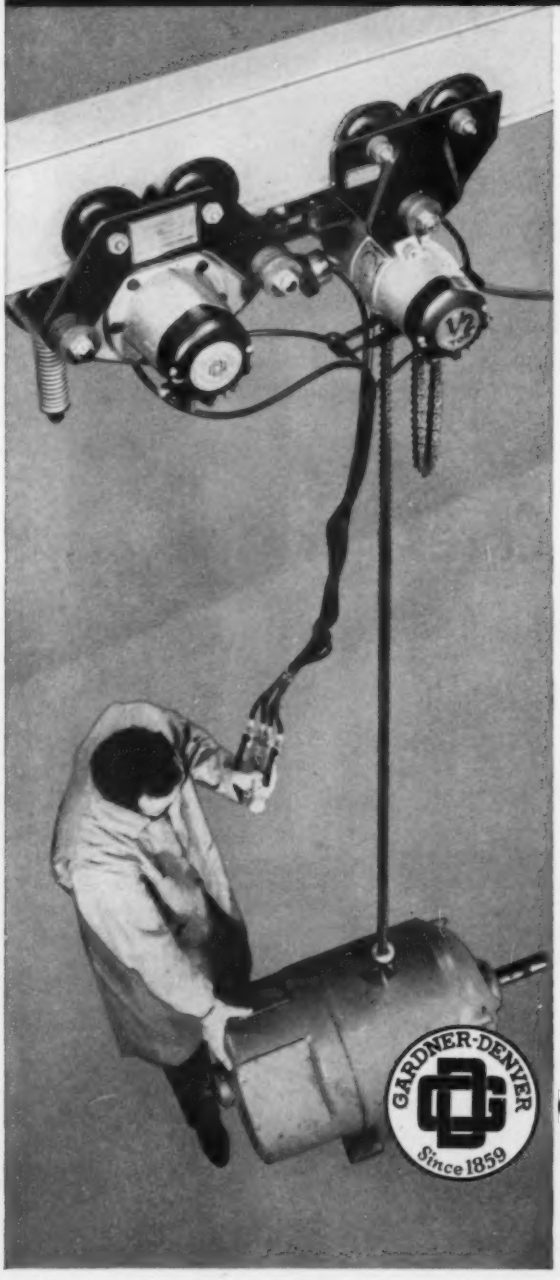
Shell Molding Copper-Base Alloys—G. W. Brown described the application of shell molding to copper-base alloys in a foundry producing castings — particularly valves — for oil, chemical, gas, and hydraulic applications. Sand precoating and shell and coremaking practices were described together with the methods used to back the molds. Aluminum was generally preferred to gunmetal for the pattern plates.

Chilling — Two Indian authors, M. R. Seshadri and A. Ramachandran, presented a paper on the relative chilling powers of various mold materials. Aluminum and its alloys were used for test castings. After briefly reviewing the literature on the effect of thermal properties of molding materials in controlling chilling power, the authors described a series of tests on aluminum alloys in which direct measurement of solidification times was used to compare silica sands bonded with bentonite or sodium silicate, magnesite and silicon carbide similarly bonded, together with metallic molds of copper, aluminum, and cast iron.

Various methods of mathematical calculation of the results led to approximately the same conclusions. The chilling power of the molding material usually increased with increase in mean heat diffusivity.

Molds made from CO_2 treated sodium silicate-bonded sand have a slightly higher chilling power than dry bentonite-bonded molds, but nearly the same chilling power as green sand molds. For the same bond, magnesite molds abstract heat a little faster than silica molds and silicon carbide faster still. Of the metallic materials, cast iron has about the same chilling power as anodized aluminum, copper being the greatest of all.





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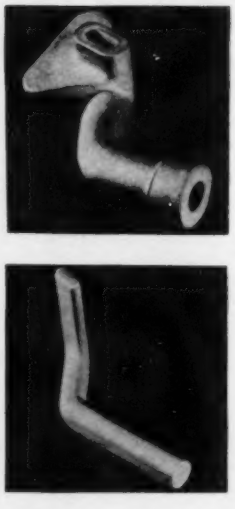

Because the cored passage in this casting (top) could not be reamed, a preformed core (bottom) was employed to assure the reliability needed

● GREATER THRUST on aircraft jet engines and rocket propulsion systems has given increasing importance to investment casting because of that medium's inherent ability to produce complex configurations from high-temperature alloys.

The trend has created a demand for precision hollow shapes to provide coolant passages and to reduce structural weight of engines. Design characteristics of the cast components are so complex, however, that accurate coring has become a significant problem.

Typical specifications of hollow castings for aircraft and space vehicle applications insist on uniform, thin-walled sections; smooth surfaces in cored areas; blind holes; and irregular (often angular) interior cavities. Tolerances are exceptionally close, too. This combination of design requirements has ruled out most conventional coring methods.

Ceramic Cores Are Used — A technique utilizing preformed ceramic cores has been accepted by the aircraft and missile industry, however, as a means of casting intricate hollow shapes to precision standards. These ceramic cores are proving their ability to produce complex configurations without design compromises.

The cores themselves are compounded specifically for each application, from refractory materials. They are produced by an injection process from hardened steel master dies. This method assures dimensional uniformity and accurate fit

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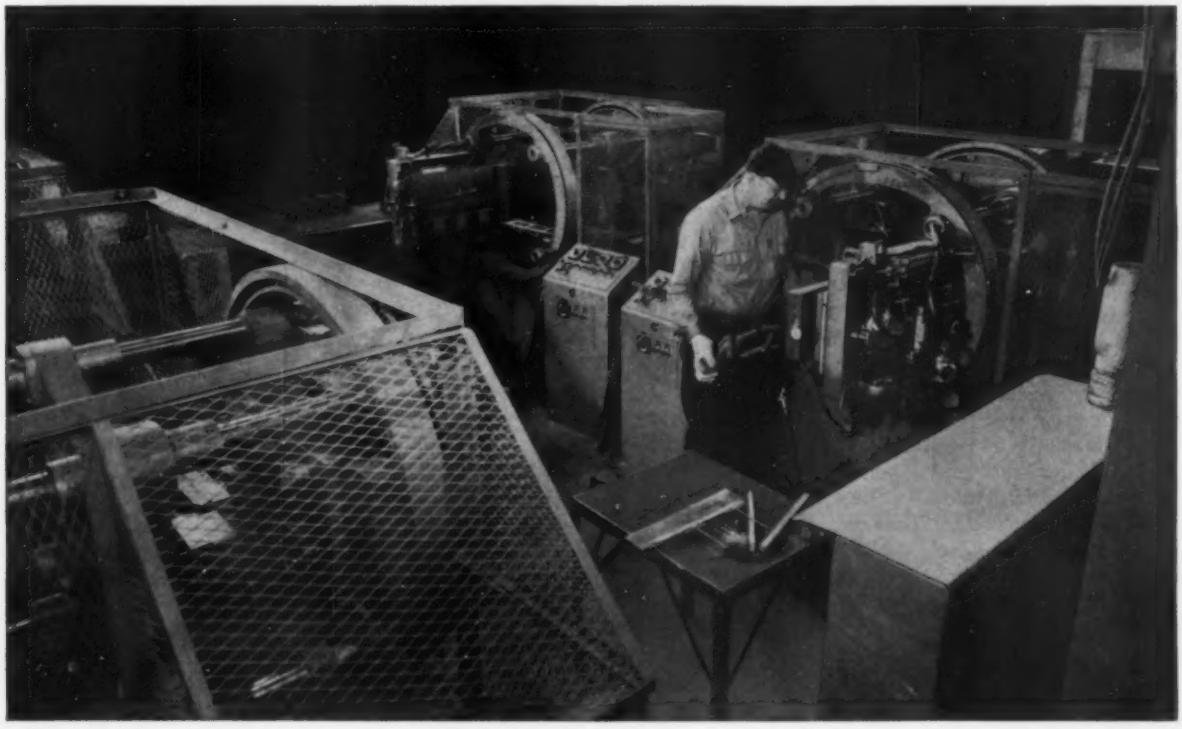

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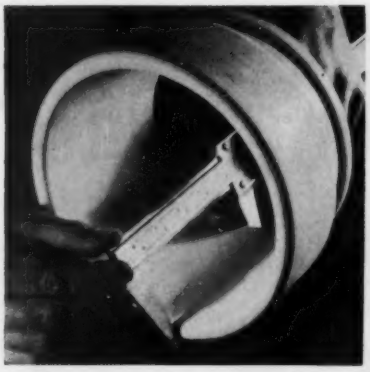
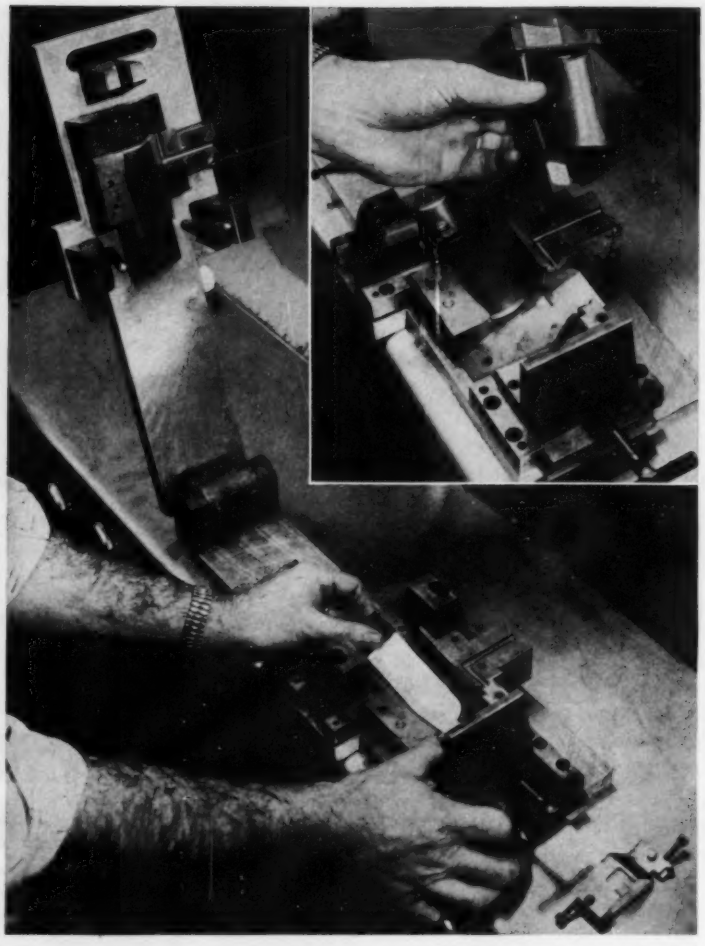


This ceramic core for a missile component weighs 3 lb and 8 oz. It replaced soluble wax cores



Ceramic core positioned in pattern die. Note provision for locating and locking the core in place. Inset shows a completed wax pattern and core

in the wax-pattern die.

Hold Close Tolerances—In addition to this uniformity, they offer other distinctive advantages. Specified dimensions can be maintained within tolerances of 0.005 in. or closer, depending on design, size, and configuration of the core. Casting surfaces in the cored area can be held to finishes of 100 rms or better.

Dimensional accuracy of the cores is reflected in the castings because of the cores' stability during the metal-pouring operation. Unaffected by multiple firings, core volume remains substantially unchanged at all casting temperatures.

Laboratory tests have demonstrated that cores of average mass expand 0.12 per cent at 1600° F and 0.23 per cent at 2300° F. They are used regularly in production of various vacuum-cast and air-cast alloys at temperatures in excess of 3000° F without deformation or destruction. Their resistance to thermal shock and extreme temperature fluctuations is such that they have been heated to 2000° F and quenched immediately in cold water without breakage.

Through custom formulas developed for each application, the core materials eliminate metal-core reaction with common as well as new high-temperature alloys. Special compositions make the cores compatible with various mold materials and processes. Preformed ceramic cores contain no residual gas and can be used in vacuum or air casting.

Because of their preformed shapes, ceramic cores overcome common disadvantages of coring techniques designed to produce a wax pattern with a hollow section into which the mold slurry must flow to produce a core. In most other instances, for example, the interior surfaces of the pattern are not accessible for visual detection of voids, blisters or imperfections which would be reproduced in the casting.

In addition, the foundryman has no assurance that the slurry will fill the cored area completely—particularly if the casting configuration includes a blind hole or complex configuration. Even when defects in the core cavity can be detected before the mold is formed, trimming or patching the pattern is a painstaking, costly operation.

Preformed ceramic cores, on the other hand, are inherently accurate because of the techniques by which they are produced. Relatively hard-surfaced and of sufficient tensile strength, they can be inspected easily with guillotine gages or other instrumentation to insure accuracy within required tolerances.

Other Advantages—They overcome other disadvantages of conventional coring techniques as well, including wax flashing, dip-coat penetration, and core removal.

Retractable cores produce wax flashing at parting lines and require delicate trimming of doubtful accuracy. This method obviously is best suited to straight-through coring where ultimate machining of the cored area would be possible.

Split-section wax patterns welded or cemented together into hollow configurations are plagued by

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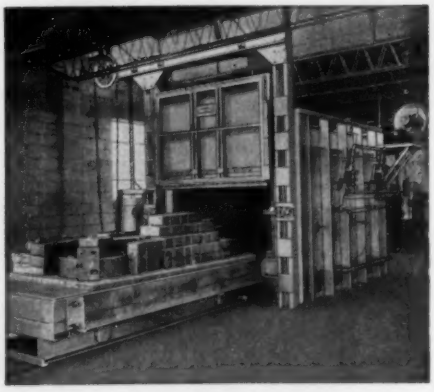

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dip-coat penetration into the cemented joints. This penetration results in flaking of the dip-coat into the cavity and inclusions in the casting. Assembly of the wax components also requires considerable skill to avoid distortion or disfiguration of the pattern.

Although generally regarded as an acceptable tool, soluble wax cores frequently are difficult to remove completely from the core cavity. Residues may cause gassing, inclusions, and malformation of the hollow interior.

Easy To Use—Use of preformed cores in the production of precision castings is simple and requires no equipment not already in use by the foundry. Core-producing dies and wax pattern dies are designed concurrently so that the injection die includes provision for locating and securing the core.

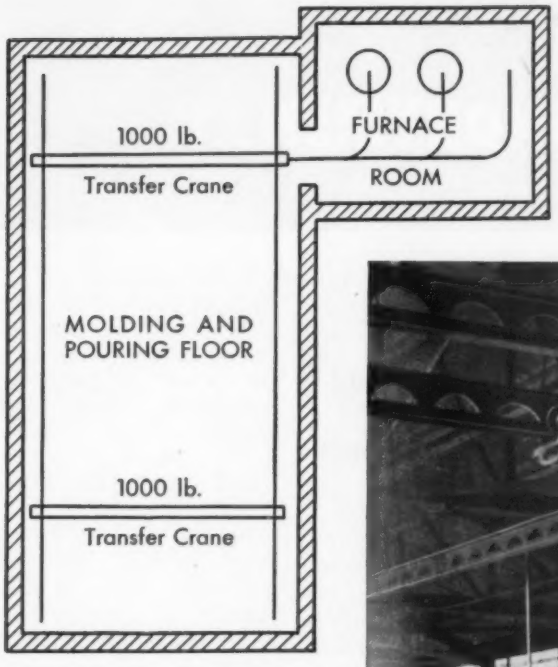
Once the core has been locked into the pattern die, wax is injected into the assembly. The pattern, with the preformed ceramic core in place, is ready for processing the mold. Protrusions of the core beyond the pattern contours lock the core in the investment flask or shell, thus becoming a part of the mold.

After the casting operation has been completed, the core can be removed by a number of methods. Leaching with a molten caustic solution in an agitated bath is the most common. Leaching rates, always relatively fast, can be accelerated by maximum surface exposure to the solution—perhaps even to the extent of providing a hole through the core. Sand blasting also may be considered in removal of the core from the casting.

New Casting Applications—Preformed ceramic cores open new avenues for application throughout the casting industry in general. Layout and production may be planned with complete confidence in dimensional accuracy and assurance of uniformity in almost any configuration, with a predetermined reference of the as-cast internal finish of the cavities. Use of such cores is not limited to the aircraft and missile field, but also can be adapted to many commercial applications. Preformed ceramic cores are designed and produced by Sherwood Refractories, Cleveland.

"Tramrail Cranes Lighten Load by 50%"

. . . declares foundry foreman



Hot metal is conveyed from furnaces to molds in fast time. Therefore, temperature drop is held to a minimum. Tramrail extended hand-wheel chain hoists permit lifts being made with the operator standing a safe distance from the molten metal.

A 240-LB. crucible for hand pouring, when full of hot metal, weighs with shank about 300 lbs. This is a heavy load for two or even three men to carry by hand and hold during the pouring of perhaps 20 to 40 molds.

At The Seagrave Corporation, Columbus, Ohio, manufacturer of fire-fighting apparatus, Cleveland Tramrail overhead materials handling equipment not only eliminates this hard work, but handles larger 750-lb. crucibles which speed production.

The Tramrail equipment consists of two transfer cranes over the molding and pouring floor and track and switch system in the furnace room. Either transfer crane can be interlocked with the track system to permit hot metal being delivered from furnaces to molds without rehandling.

The overhead equipment is also used for many other handling jobs such as moving flasks, sand, castings, etc. It reduces the time for this work and eases the burden on the foundrymen.

The foreman of the foundry declares, "These Tramrail cranes lighten the load by 50%. They are saving men's backs and making the work safer. Now the men don't take a lot of time off because of aches and burns."

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ASTM Changes Name

Revises Casting Specifications

By EDWIN BREMER
Metallurgical Editor

● TO RE-EMPHASIZE the importance of ASTM as a materials society as well as one providing standard test methods, its name was changed to American Society for Testing and Materials at the 64th annual meeting held at Atlantic City, N. J., on June 26-30. The initials ASTM and the society's emblem are retained intact.

New officers elected at the meeting include M. N. Clair, Thompson & Lichtner Co. Inc., Brookline, Mass., president, and A. C. Webber, E. I. du Pont de Nemours & Co. Inc., Wilmington, Del., vice president.

Newly elected directors are A. M. Bounds, Superior Tube Co., Norristown, Pa.; A. G. H. Dietz, Massachusetts Institute of Technology, Cambridge, Mass.; B. W. Gonser, Battelle Memorial Institute, Columbus, Ohio; W. A. Kirlin, Hercules Powder Co., Wilmington, Del.; G. M. Kline, National Bureau of Standards, Washington, and J. B. Rather Jr., Socony Mobil Oil Co. Inc., Brooklyn, N. Y.

Awards Presented—At the Awards Luncheon 17 members were presented with ASTM Award of Merit certificates in recognition of distinguished service to the society, especially along technical lines. Among those so recognized were Thomas E. Eagan, chief research metallurgist, Cooper-Bessemer Corp., Grove City, Pa., for his long and continued service to Committee A-3 on Cast Iron, and J. H. Lansing, castings consultant and excutive secretary, Ductile Iron Society, Shaker Heights, Ohio, for his service to Committee A-7 on Malleable Iron.

Recognition certificates were presented also to long-time members. Those included the American Foundrymen's Society, 60 years; General Motors Corp., 50 years; Ohio Steel Foundry Co., 40 years. Other 40-year members are R. E. Hess, associate executive secretary, ASTM; Sam Tour, Sam Tour & Co. Inc., and V. T. Malcolm, Indian Orchard, Mass.

Robert J. Painter, consultant to the executive secretary, ASTM was presented an illuminated certificate appointing him executive secretary emeritus of the society for life.

Technical Papers—Papers of interest to foundrymen included "Creep and Rupture Properties of Five Copper-base Casting Alloys" by Donald P. Moon and Ward F. Simmons, Battelle Memorial Institute. The alloys tested were the 76 Cu, 2¼ Sn, 6½ Pb, and 15 Zn; 65,000 psi manganese bronze; 110,000 psi manganese bronze; 20 per cent nickel silver, and 81 Cu, 4 Si, 15 Zn silicon brass. Test temperatures were between 250 and 550° F, and the longest time at test temperatures was about 2000 to 3000 hours.

Another paper was "Tensile and Impact Properties of Cast Stainless Steels of Cryogenic Temperatures" by E. R. Hall, Esco Corp., Portland, Oreg. Study was made with seven steels, including types CF-8, AISI 304, CF-3, CF-8M, AISI 316, CF-3M, and CF-8C. Test data at minus 108, minus 320, and minus 430° F were presented.

THOMAS E. EAGAN
ASTM Award of Merit

Specification Changes — Committee A-3 on Cast Iron recommended revisions in two tentative specifications. In A 278-59T on Tentative Specifications for Gray Iron Castings for Pressure-containing Parts for Temperatures up to 650 F, the certification clause was changed to include a copy of the test report, or a statement with a copy of the test report that the material has been sampled, tested, and inspected in accordance with the specification.

In A 436-59T on Tentative Specifications for Austenitic Gray Iron Castings, two new types were added. Type 1b contains 3.00 max TC, 1.00 to 2.80 Si, 1.00 to 1.50 Mn, 13.50 to 17.50 Ni, 5.50 to 7.50 Cu, 2.50 to 3.50 Cr, and 0.12 max S. Minimum TS is 30,000 psi, and Bhn 149 to 212. Type 2b contains 3.00 max TC, 1.00 to 2.80 Si, 0.80 to 1.50 Mn, 18.00 to 22.00 Ni, 0.50 max Cu, 3.00 to 6.00 Cr, and 0.12 max S. Minimum TS is 30,000 psi and Bhn 171 to 248.

Standard A 126-42 on Standard Specifications for Gray Iron Castings for Valves, Flanges and Pipe Fittings was reverted to a tentative status with changes in the references to tranverse test and tensile test specimens. The committee recommended the withdrawal of A 190-47 on Standard Specifications for Lightweight and Thin-section Gray Iron Castings due to lack of use, and A 196-47 on Standard Definitions of Terms Relating to Cast Iron.

Committee A-1 on Steel recommended changes in A 351-60T on Tentative Specifications for Ferritic and Austenitic Steel Castings for High Temperature Service. One was the redesignation of grade CK20 to CK45, and revising the carbon requirement from the present 0.20 to 0.20-0.45, and silicon from the

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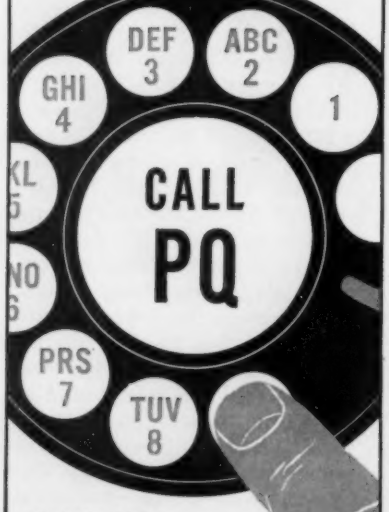

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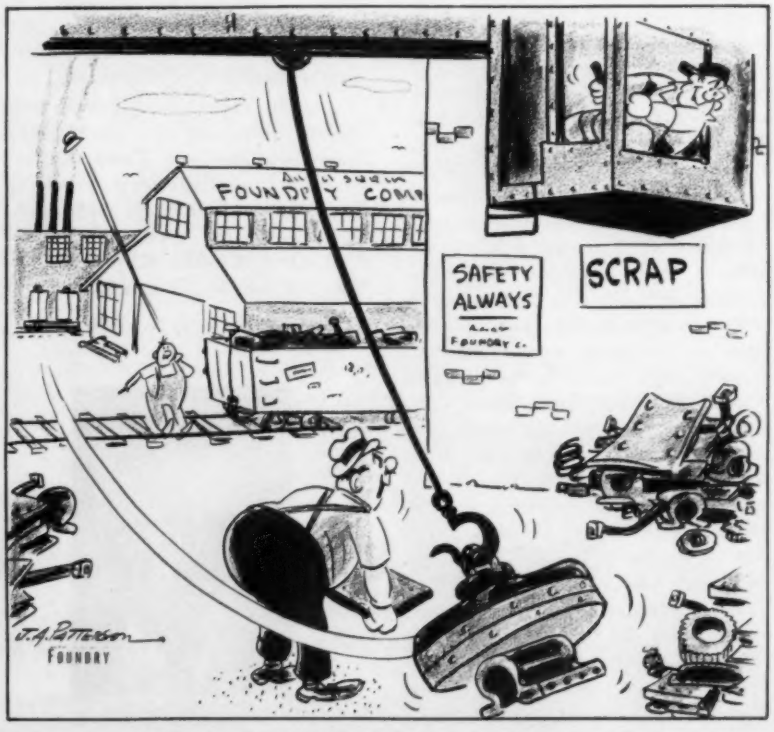
present 2.00 to 1.75 max. A new grade CF3 was added which contains 0.03 max C, 1.50 max Mn, 2.00 max Si, 0.040 max S, 0.040 max P, 17.0 to 21.0 Cr, and 8.0 to 12.0 Ni.

A 370-54T on Tentative Methods and Definitions for Mechanical Testing of Steel Products has been revised extensively. A 426-59T on Tentative Specifications for Centrifugally Cast Ferritic Alloy Steel Pipe for High-temperature Service has been changed in relation to samples for chemical analysis which, except for spectrochemical analysis, shall be taken in accordance with ASTM specification E 59. The committee also has recommended two new tentatives for castings. One is on Centrifugally Cast Austenitic Steel Pipe for High Temperature Service, and the other on Austenitic Centrifugally Cast Cold-wrought Pipe for High Temperature Service.

Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys joined with Committee A-1 on Steel in recommending the two previously mentioned tentatives on centrifugally cast austenitic steel pipe. It also recommended the addition of a new grade to A 296-60T on Tentative Specification for Corrosion-resistant Iron-chromium and Iron-chromium-nickel Alloy Castings for General Application. The designation is CN-7M containing 0.07 max C, 1.50 max Mn, 1.50 max Si, 0.040 max S and P, 19.0 to 22.0 Cr, 27.5 to 30.5 Ni, 2.0 to 3.0 Mo, and 3.0 to 4.0 Cu. Tensile properties are given as 62,500 psi min TS, 25,000 psi min yield and 35 per cent min elongation.

Committee A-7 on Malleable Iron Castings recommended revisions in one tentative and two standard specifications to include at the end of the scope, the addition of the words "at both normal and elevated temperatures." In addition, new appendixes were added to the three. They provide data on the high-temperature characteristics of the several materials. The committee also presented the first of a series on corrosion results on malleable iron entitled "Corrosion Test Results on 15 Ferrous Metals After 1-yr Atmospheric Exposure." Others will be reported after 3, 7 and 12-year exposures.

Nonferrous Specifications — Committee B-5 on Copper and Copper Alloys, Cast and Wrought recommended one new Tentative Specification for Copper-nickel Alloy Cast-



"See here, Finchbottom, are you trying to intimidate me?"

ings covering the 90 Cu-10 Ni and 70 Cu-30 Ni types. Tensile requirements for the 90-10 alloy are 45,000 psi min TS, 25,000 psi min YS, and 20 per cent min elongation. For the 70-30 alloy the values are 60,000 min TS, 32,000 psi min YS, and 20 per cent min elongation.

Also ten standard specifications were recommended for reapproval as standards. These were B 66-52 on Bronze Castings in the Rough for Locomotive Wearing Parts; B 67-52 for Car and Tender Journal Bearings, Lined; B 132-52 for Leaded High-strength Yellow Brass (Manganese Bronze) Sand Castings; B 144-52 for High-leaded Tin Bronze Sand Castings; B 146-52 for Leaded Yellow Brass Sand Castings for General Purposes; B 147-52 for High Strength Yellow Brass Manganese Bronze and Leaded High Strength Yellow Brass (Leaded Manganese Bronze) Sand Castings; B 148-52 for Aluminum Bronze Sand Castings; B 149-52 for Leaded Nickel Brass (Leaded Nickel Silver) and Leaded Nickel Bronze (Leaded Nickel Silver) Sand Castings; B 198-58 for Silicon Bronze and Silicon Brass Sand Castings, and B 119-45 for Standard Classification of Cast Copper-base Alloys.

Tentative Specification for Bronze Castings for Bridges and Turntables (B 22-60T) was recommended for adoption as a standard with revision.

MAGNETIC CLEANING: A magnet-equipped fork lift truck picks up any metallic debris from the 10 miles of plant highways and storage areas at the Timken Roller Bearing Co.'s Gambrinus plant, near Canton, Ohio. A circular magnet is mounted below the truck's forks and a 15-kw gasoline-driven generator above them

Book Review

High-Strength Steels for the Missile Industry, **edited by H. T. Sumsion, cloth, 276 pages, 8½ x 11 in., published by the American Society for Metals, Novelty, Ohio. Price $12.**

Contains 14 papers discussing problems in development and application of high-strength steels in the missile program which were presented at a symposium held during the Golden Gate Metals Conference in San Francisco in February, 1960. Papers include "Materials and Fabrication Problems in Pressure Vessels," "Stress Corrosion of Aircraft and Missile Steels," "Fracture Theory in Pressure Vessels," "Pressure Vessel Reliability," "NASA's Program—High-strength Sheet Alloys."

Also, "New Ultra High-Strength Steel for High-performance Rocket Motor Cases," "Fabrication Techniques for Rocket Motors," "Shear Spinning in Fabrication of Solid-propellant Rocket Cases," "Large Solid-propellant Rocket Case Fabrication by Deep Drawing," and "Future Applications of High Strength Steels."

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AROUND the COUNTRY

Casting Operations Still Vary Regionally

PHILADELPHIA—A slight pick-up in casting production is anticipated for August. There will still be vacations and hot weather, but their adverse effects are expected to be less than in July when production declined for the second consecutive month and perhaps to the low point of the year.

Gray iron production in July was estimated at 55-60 per cent of normal capacity, compared with 65 per cent, or a shade less, in June and approximately 70 per cent in May.

Construction and power transmission needs are holding fairly well, but gray iron casting demand for papermaking machinery has slipped and there is little work from manufacturers of dies and tobacco processing machinery. Most gray iron job shops report backlogs of one to two weeks.

Production of steel castings is estimated at around 60 per cent of normal capacity. Heavy industrial equipment requirements remain slow, and although a fair amount of ship work is being figured, volume continues disappointing. Some steel foundries are operating five days a week, but in no case with full working forces. Backlogs are small, averaging around three weeks.

Lag in production of malleable castings has been aggravated by strikes, particularly in the Lancaster area where most contracts expired June 30. Manufacturers of malleable fittings report continued competition from abroad.

Following some improvements in June, production of brass and bronze castings has slowed considerably at both captive and independent shops. Aluminum foundries are moderately active, with demand diversified.

Bierman-Everett Foundry Co. Inc., Irvington, N. J., has acquired the West Bergen Iron Foundry Inc., Jersey City, N. J. Operations are being consolidated at Irvington, where Bierman-Everett's gray iron capacity is being increased by 50 per cent as a result, according to V. Julius, president. Andrew Viacava, West Bergen Iron, has been named vice president in charge of the newly formed West Bergen Iron Div. The Bierman-Everett plant will continue to produce brass, and bronze and aluminum castings.

DUCTILE IRON SOCIETY: Members of the Ductile Iron Society came from as far as Texas, Alabama, and New York to attend a June 23 regional meeting in Columbus, Ohio. Speakers and their subjects included, left to right, Don Crews, James B. Clow & Sons, Coshocton, Ohio, on centrifugal castings; M. S. Genter, White Diesel Engine Div., White Motor Co., Springfield, Ohio, on diesel engine castings; B. K. Guise, Kuhns Bros. Co., Dayton, Ohio, on small ductile iron castings; and Robert S. Thompson, H. P. Deuscher Co., Hamilton, Ohio, society president, on second-half 1961 ductile iron production

New England Makes Big Gains

BOSTON—Most New England foundries have resumed operations after vacation at higher operating levels, although increases in melt vary. Some gray iron shops have backlogs until Labor Day and are producing at close to capacity. With others, gains are limited to 10 to 15 per cent.

Over-all second-half volume promises to be substantially over that of the first six months. Prices continue to be low and erratic, but demand for castings is well diversified, and most consumers still press for delivery, indicating that inventories are low. Most foundrymen here feel that the second half will be around 20 per cent better than the first for gray iron castings.

Nonferrous shops are keeping pace with iron producers, and some are showing even larger gains. Several captive shops are operating at more than 75 per cent of capacity, with September likely to show an additional gain over August. Nonferrous inventories declined to a low point, and part of the current increase in production is devoted to the replacement of stocks.

F. S. Payne Co., Franklin, Mass., has been liquidated. Its Foundry Div. equipment included two 8-ton cupolas.

Midwest Operations only Fair

CHICAGO—In mid-June, a group of management representatives of 16 midwestern gray iron jobbing foundries reported that they viewed the business outlook for the next three months as little better than fair. Order backlogs generally ranged

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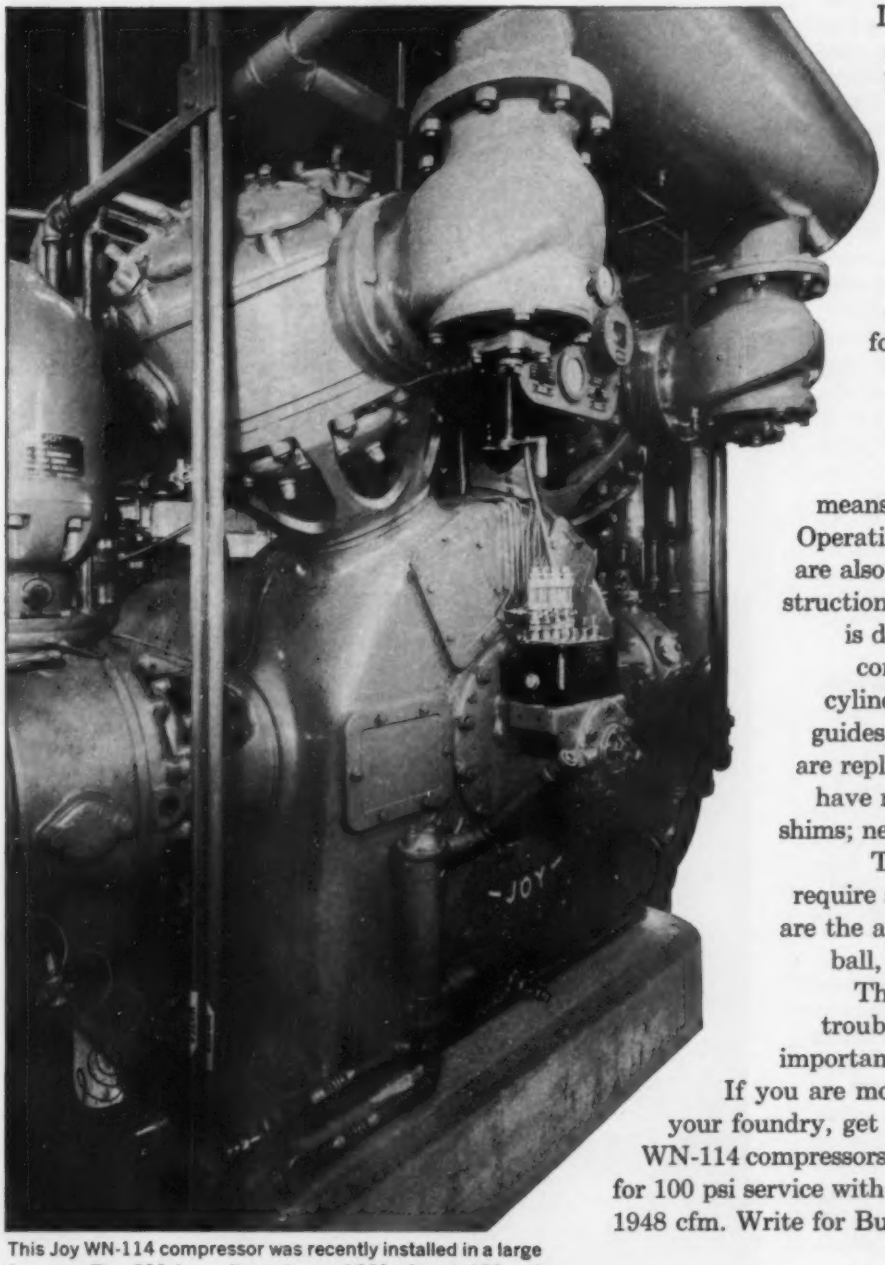
JOY WN-114 COMPRESSORS



This Joy WN-114 compressor was recently installed in a large foundry. The 300 hp unit produces 1660 cfm at 100 psi.

If your total compressed air requirement is in the 1300 to 2000 cfm range, you can handle it with one compact machine —the Joy WN-114. The machine arrives at your plant completely assembled. You simply set it on a block foundation, bolt it down, and connect air and water lines, as this recent foundry installation was handled. This means lower installation cost. Operating costs of the WN-114 are also low because every construction feature of the WN-114 is designed for heavy-duty, continuous operation. The cylinder liners and crosshead guides, made of special alloys, are replaceable. The crossheads have no wedges, set screws or shims; never require adjustment. The main bearings never require adjustment either; they are the anti-friction, heavy-duty ball, or spherical roller type. These features mean easy, trouble free service that is so important to foundry operations. If you are modernizing or expanding your foundry, get complete details on the WN-114 compressors. There are three models for 100 psi service with capacities from 1385 to 1948 cfm. Write for Bulletin 3526-13.

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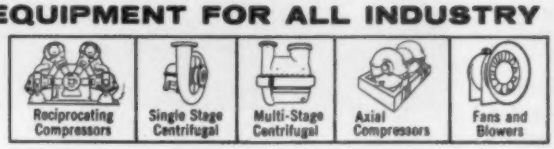

JOY

Joy Manufacturing Company
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from two to four weeks, and then current operations averaged less than 40 hours per week.

Only two foundries viewed business prospects as good; the majority sized the situation up as fair. One shop indicated that its backlog was only three days, about a third reported two weeks, and another third four weeks. Ten shops were running a full 40 hours, the remainder between 32 and 40 hours.

Individual appraisals were influenced, to some extent, by the fact that July would be a dull month because of scheduled closing down of numerous foundries for annual vacations.

• • •

Responsibility for the new ingot mold foundry of Inland Steel Co. has been assigned to Victor E. Schlossberg, assistant general manager, Operating Services. The new plant, under construction at the company's Indiana Harbor Works, East Chicago, Ind., and scheduled for completion in 1963, will have an initial capacity of 150,000 tons of molds and mold stools a year.

• • •

In June, International Harvester Co. terminated its nodular iron operations at the McCormick Works, Chicago, and completed their transfer to its Memphis, Tenn., foundry, where all of the company's nodular production is being concentrated in a modern facility converted from gray iron. The 45 buildings of McCormick Works are being torn down.

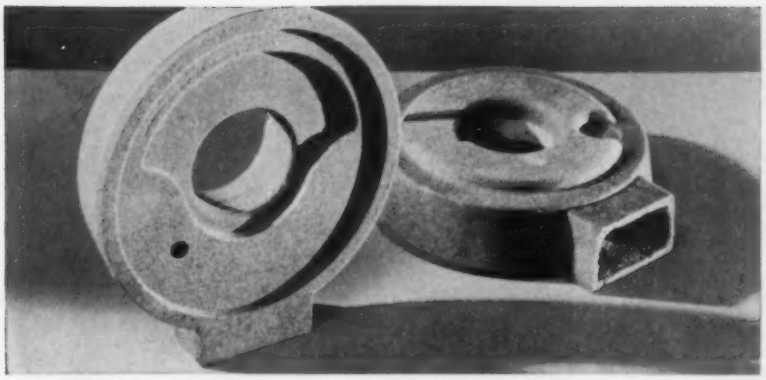
Pittsburgh Looks to Fall

PITTSBURGH—With vacations behind them, foundrymen are hopeful that August business will be better than July's, but few expect much real improvement before the fourth quarter.

First-half operations were disappointing, and it was hard, as the half ended, to predict when an upturn might come. At some foundries, there were signs of improvement, but no one could say how long the uptrend would last. Customers were living from hand to mouth, forcing suppliers to carry inventory for them and ship their requirements on short notice.

One of the best reports came from the sales chief of a leading steel foundry: June orders were up sub-

Shell cores start a chain reaction and lop 50% off core costs



Read how cores like these bonded with Durez resin are setting new records for economy at Auto Specialties Co. (Canada) Limited.

They weigh much less, so they're easier to handle. They use less sand.

But that's only the start of snowballing savings this foundry makes with shell cores—cores bonded with Durez foundry resins.

On one casting, for instance—an automotive differential housing—dimensions are so accurate now with shell cores that gauging has been eliminated. A tube core fits the body core so snugly that flash no longer forms on the inside of the casting. As a result, foundrymen have been able to forget about a previously needed air-hammer chipping operation.

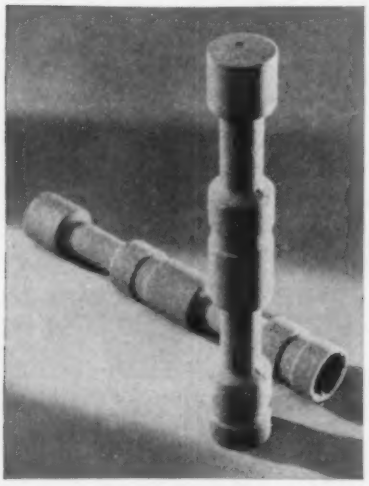
Altogether, savings come to just about *half* the previous core cost. And the foundry is chalking up similar records on many other jobs.

Fewer cores needed. Multiple stick cores now replace single cores to save setting time. One casting, formerly made with four oil-sand cores, requires only two shell cores.

What's more, the shell cores don't

have to be dried. When finished, they're sturdy enough to stack without breaking. Because less storage space is needed, it's much simpler now to maintain a backlog of cores for filling rush orders.

Is it any wonder that, after producing 70,000-plus shell cores, men of this foundry are sold on the process more solidly than ever?



What you can do about this. One good way to explore shell-core economies for your foundry is to call in your Durez technical service man. He has helped many foundries convert to this process, so can give you answers based on practical experience. He can show you how to minimize shell-core and shell-molding problems with the consistent day-to-day and month-to-month results Durez foundry resins give you. Have a talk with him soon.

Here's the latest on shell molding—authoritative, up-to-the-minute data on patterns, materials, mixing, temperatures, lubricants, molds, cores. It's the 36-page *"Durez Guide to Shell Molding"* that can help you evaluate the process for your foundry. Write for your free copy today.

DUREZ PLASTICS DIVISION
HOOKER CHEMICAL CORPORATION
1008 WALCK ROAD, NORTH TONAWANDA, NEW YORK

HOOKER CHEMICALS PLASTICS

For More Information Circle 634, Page 87

stantially from May's, and the best of any month this year. At another steel foundry, orders booked in the first week of July exceeded total business for June and promised to make the month the best one in more than a year. "The gains we've made have been entirely in industrial sales," a company spokesman commented. "Railroad business declined steadily in the first half. It's still down, and there's no indication that it's going to be better soon."

If June and July brought encouragement to some foundrymen, however, they brought dismay to others. A major gray iron foundry had lower sales in June than in any previous month this year. "I can't understand it," the firm's operating head declared. "June normally is one of our best months. This time, inquiries dropped sharply."

With district steel mills operating at less than 60 per cent of 1960 capacity, there's little demand for castings used in maintenance and repair work. Buyers are keeping their inventories down and awarding their orders to the low bidders.

May Use V-6 Gray Iron Block

DETROIT—Talk in Detroit automotive circles these days is that Buick will offer a V-6 gray iron engine as the standard powerplant in its compact Special in 1962, displacing the current permanent molded aluminum V-8.

A Buick spokesman questioned by FOUNDRY stated, "There is absolutely no truth to the rumor that General Motors Corp. will discontinue production and use of the aluminum block V-8 engine in the compact Buick." This disclaimer does not, of course, preclude the possibility that Buick will continue to offer the aluminum block, but only as an option, as Pontiac does in its Tempest, for a premium price.

It is believed that the aluminum engine has performed satisfactorily but is more expensive to produce than gray iron, and Detroit is known for its cost consciousness. Buick's aluminum block and heads have been produced by Central Foundry Div., as have those for the Oldsmobile F-85 and the Tempest. There is no information yet as to what would happen to the Olds and Pontiac engines or who would produce the gray iron V-6.

Tote box moves castings up to a blast unit loader as a cleaned load is discharged automatically

After a preset time, blast action stops, the door opens, and cleaned castings are discharged

Efficient Handling System

Speeds Blast Cleaning

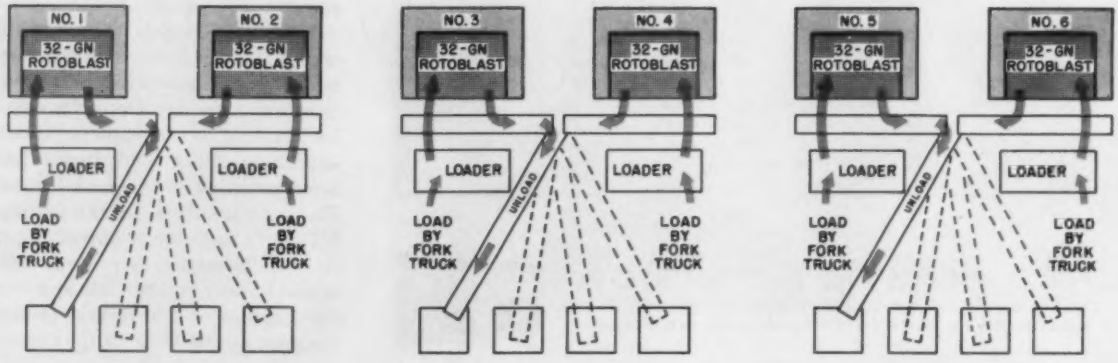
● AN EFFICIENT material handling system is an important factor in saving blast cleaning costs for a high-production automotive foundry.

This foundry recently replaced ten airless blast barrels with seven new machines and provided a handling system which permits rapid delivery and removal of the work. The equipment was designed to maintain the castings in separate batches so that continual sorting would not be required.

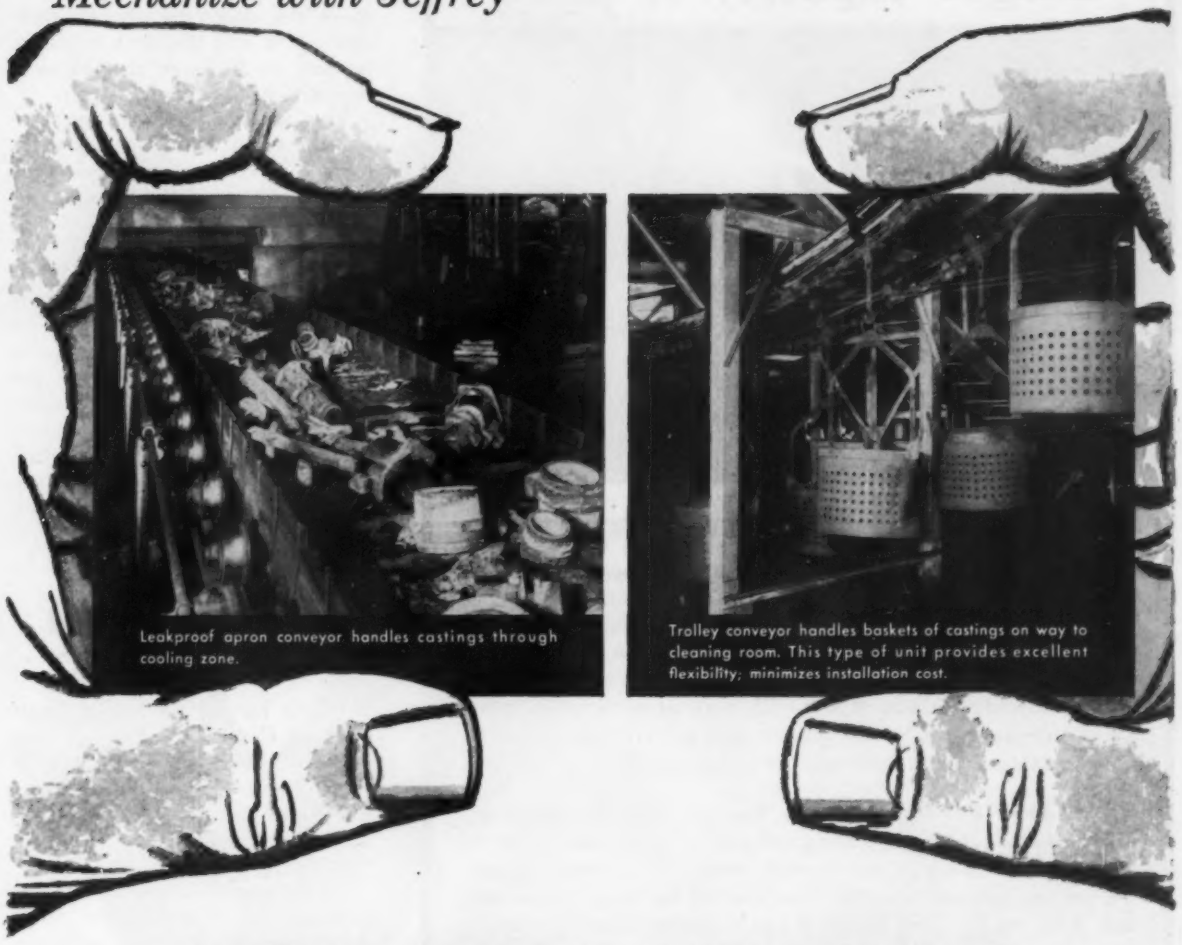
Six of the seven 32-cu-ft blast barrels are arranged in a row, in pairs, with an unloading conveyor system serving each pair. The seventh barrel is stationed in another area, to be closer to the workflow of the particular material it handles. At the main cleaning line, lift trucks move the castings from rough finishing to blast cleaning, dumping directly into one of the six barrel loaders. Each tote box handles a full barrel load.

When a pushbutton is pushed, the automatic cycle starts. The loader loads and returns to battery. Barrel door closes, abrasive flows and blast action starts. At the end

Diagram shows six of the blast barrels arranged in pairs, with a conveyor system serving each pair. Conveyors move castings to tote boxes



Mechanize with Jeffrey



Leakproof apron conveyor handles castings through cooling zone.

Trolley conveyor handles baskets of castings on way to cleaning room. This type of unit provides excellent flexibility, minimizes installation cost.

MECHANIZED CONVEYING OF CASTINGS CUTS YOUR COSTS

Rugged conveyors—apron, pendant (trolley), or vibrating—move castings efficiently and quickly from shakeout, through cooling zone, to cleaning room. Speeds can be selected for ample cooling time—for chipping and sorting en route.

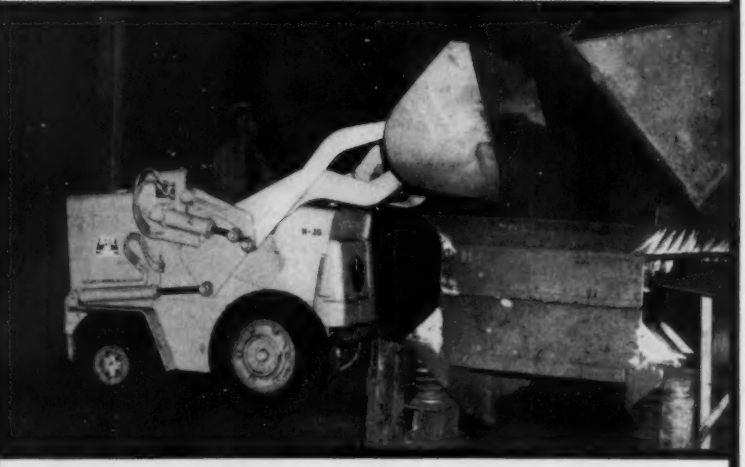
Starting with basic requirements, Jeffrey Foundry Engineers will help you select just the right conveying equipment for castings... will erect the installation (if desired), and stay on the job until everything is in top-notch working order.

Other foundry operations are important, and Jeffrey builds for them too. Consult our Foundry Engineers for cost-cutting ideas in Sand Handling and Conditioning, Mold Preparation, Castings Handling or for special unit machines. Catalog No. 911 tells all—write, The Jeffrey Manufacturing Company, 907 N. Fourth St., Columbus 16, Ohio.

JEFFREY

If it's conveyed, processed or mined, it's a job for Jeffrey.

Larger capacity of H-25



improves handling system

For More Than 10 Years PAYLOADER tractor-shovels have been "standard equipment" at the Carondelet Foundry Co. in St. Louis for all sand handling duties. They have four of the 2,000-lb. capacity HA units and recently added a new Model H-25 PAYLOADER (2,500-lb. cap.). These units handle about 250 tons of sand per evening, first to the shaker and, later, for redistribution to molding stations.

Plant Engineer Don Meiners states, "Our new H-25 is a bigger and better machine all the way around and will be used primarily for the longer runs (500-ft.) in the foundry because of its larger capacity. We had two competitive machines in here but the Hough's have them beat. One was too slow, the other needed more maintenance besides being too light."

Foundries and Plants of all types have found the answer to *low cost bulk handling* in the H-25. It easily handles 2,500-lb. loads, travels up to 11 mph. in either direction, has power-steering and complete power-shift transmission for quick maneuvering. Dependable, low maintenance performance is assured with its closed, pressure-controlled hydraulic system *plus* special filters and seals throughout to protect mechanical and electrical parts against dust, moisture and corrosion damage.

You can expect to have an H-25 PAYLOADER pay for itself very quickly through savings in increased output and low operating costs. Why not contact a nearby Hough Distributor for more information or return the coupon below.

HOUGH®

THE FRANK G. HOUGH CO.
703 Sunnyside Ave.
Libertyville, Ill.
SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

☐ H-25 "PAYLOADER" data
☐ Other "PAYLOADER" UNITS up to 12,000-lb. operating cap.

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8-A-2

of the preset time cycle—8 to 12 minutes—the blast turns off, the work tumbles a little longer to remove the shot, the abrasive-tight door opens and the work conveyor reverses to discharge cleaned castings to a belt conveyor.

This conveyor (and the one serving the other barrel of the pair) feeds a power-positioned belt conveyor which moves the cleaned load directly into one of four waiting tote boxes. By using four tote boxes for each barrel pair—12 in all—there are always plenty of empties at each discharge station to be filled without delay. Lift trucks, of course, quickly haul away the filled tote boxes and replace them with empties.

Only two operators are required for the entire battery of six barrels.

These barrels were supplied by the Pangborn Corp., Hagerstown, Md.

Schedule East Coast Regional For New York, Sept. 22-23

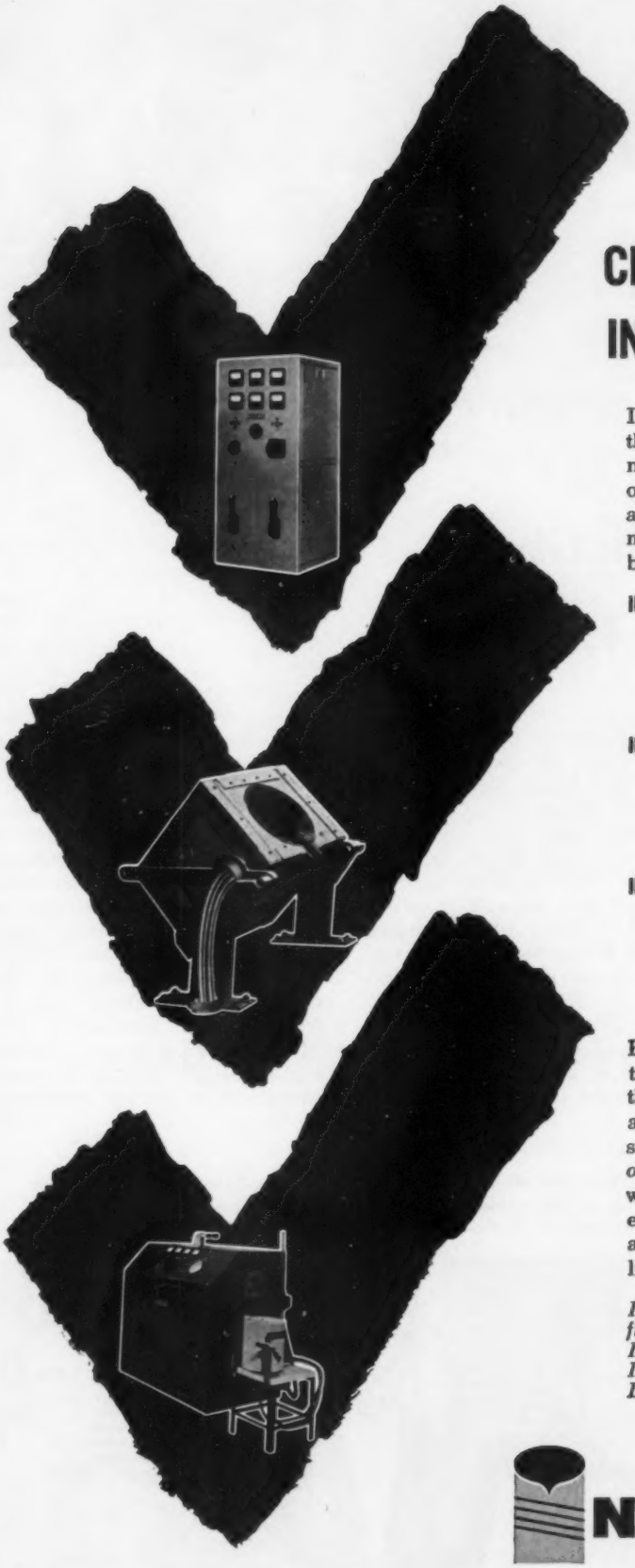
Theme for the 1961 East Coast Regional Conference of the American Foundrymen's Society will be "New Frontiers in Metal Castings." The conference is to be held at the Statler-Hilton Hotel, New York, Sept. 22-23.

Thirty speakers from the foundry industry will present papers pointing up recent technical advances and opportunities involving steel, gray iron, ductile iron, aluminum, magnesium, brass and bronze, and malleable iron castings. Morning and afternoon technical sessions are scheduled for the first day, Friday, and a morning session on Saturday.

Material Handling Society Opens Office, Picks Secretary

The American Material Handling Society has opened a permanent headquarters office at 2860 E. 130th St., Cleveland 20. Although the society is ten years old and has some 5000 members throughout the world, this is the first time it has had any full-time paid employees.

Picked for the job of secretary is W. B. McClelland, widely known as a speaker and author on material handling subjects.



CHECK THE BIG CHANGES IN INDUCTION MELTING

In just seven years, Inductotherm has changed the face of induction melting with a barrage of new ideas. Some have resulted in lower costs . . . others have simplified operation, maintenance, and installation. But all have been aimed at making induction melting more useful, and a better buy, than ever before.

IDEA #1 . . . *Packaged Controls:* By shrinking the size of capacitor banks to permit behind-the-panel mounting, Inductotherm was able to introduce the first pretested, prewired melting furnace controls in induction history.

IDEA #2 . . . *Integral Power:* M-G set, starter, transformer and capacitors were first packaged as a compact movable unit in the melting control console of the Inducto "Integral" series, which now includes capacities up to 100 KW.

IDEA #3 . . . *Design Innovations:* Inductotherm has consistently been first with new features in furnace design. Tilting furnace power feed through the trunions is one example, Heliarc welded furnace construction is another.

But these ideas barely scratch the surface. For the greatest innovation has been the Inductotherm concept of service. Not just fast repairs and overnight replacement of parts (even M-G sets) . . . but a basic concept: *Inductotherm is out to fit induction melting to your needs.* We will make every possible effort to improve our equipment and the induction technique, never asking you to trim your requirements to the limitations of our equipment.

If you'd like more information on Inductotherm furnaces, write for Bulletin 70. But, for a taste of Inductotherm service, ask to have an engineer call. Inductotherm Corporation, 412 Illinois Avenue, Delanco, New Jersey.

INDUCTOTHERM

For More Information, Circle 637, Page 87

1961-62 Officers and Directors of the Alloy Casting Institute

Alloy Casting Institute

To Step Up Promotion Program

A PROGRAM of expanded and more aggressive promotion was launched by members of the Alloy Casting Institute at their recently held 21st annual meeting at The Homestead, Hot Springs, Va.

Expansion of the marketing activity will include publication of a quarterly for the benefit of designers and users of high alloy castings; the establishment of a clinic program to be held in various cities throughout the country; publication of a design and application handbook; development of promotional aids for member companies; and possible production of a motion picture or slide film explaining the technical advantages of high alloy castings.

Re-elected to serve as president of the institute was J. D. Hagans, sales manager, Ohio Steel Foundry Co., Springfield, Ohio. New vice president is J. W. MacKay, vice president of sales, American Cast Iron Pipe Co., Birmingham. E. A. Schoefer, Garden City, N. Y., was re-elected to the position of executive vice president and treasurer.

W. D. Raddatz, president, Electro-Alloys Div., American Brake Shoe Co., Elyria, Ohio, and T. R. Heyward III, secretary, Duraloy Co., Scottdale, Pa., were named to the board of directors. Mr. Heyward also was named 1961-62 chairman of the public relations committee, which will handle the expanded marketing program.

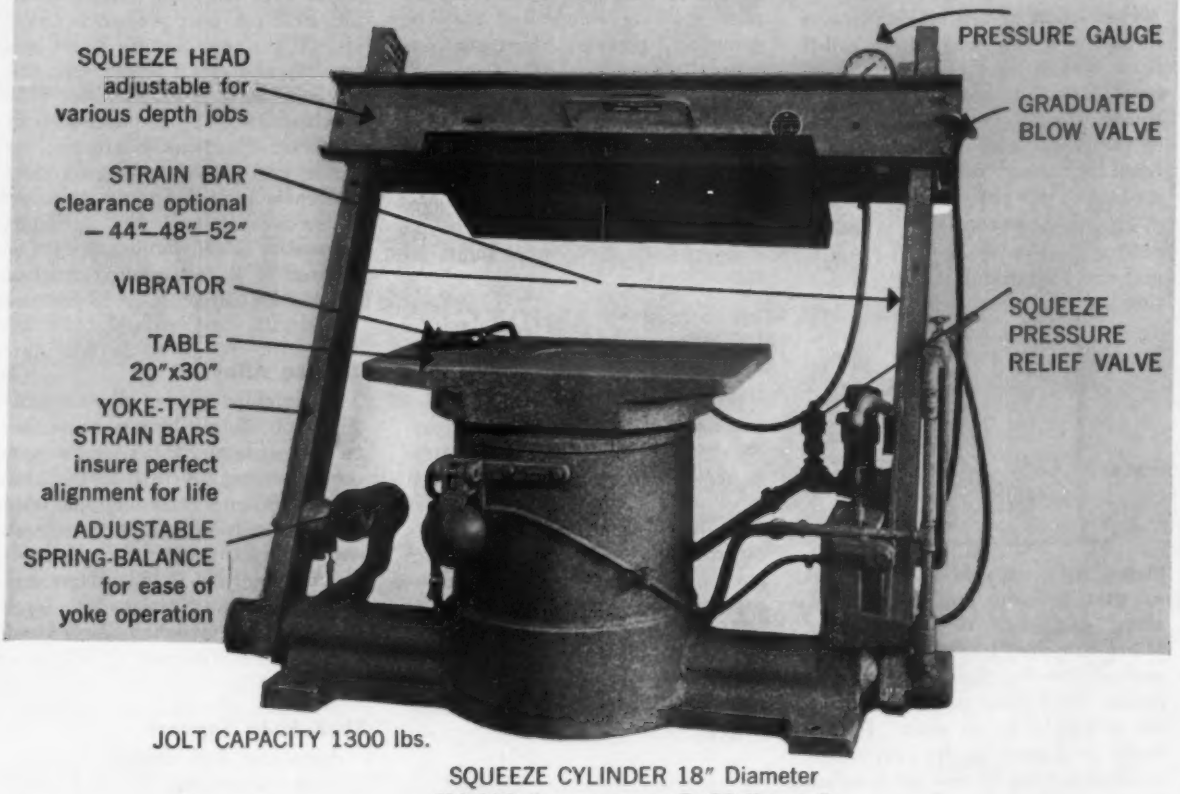
Evidence that cast alloys are stronger at high temperatures and more resistant to stress-corrosion than equivalent wrought alloys was reported by David Zuege, technical director, Sivyer Steel Casting Co., and chairman of the institute's Technical Research Committee. Technical evidence indicates that cast alloys serving as load-carrying components at temperatures above 1600°F have far greater resistance to deflection than wrought alloys of equivalent composition. This information is the result of a continuing ACI research program on the effect of grain size on high-temperature strength.

A long-standing belief that 18-8 stainless must be nonmagnetic for maximum corrosion resistance was refuted by the report of another ACI research project. In fact, according to the report, some magnetism—indicating the presence of ferrite—is beneficial since the ferrite improves resistance to stress-corrosion cracking. The "no-ferrite" limitation on wrought 18-8 alloys does not apply to cast alloys since the presence of ferrite does not affect their castability. In the cast alloys tested, ferrite content was increased by careful control of constituent elements, and a marked increase in stress-corrosion resistance was observed.

New ACI officers include, left to right, E. A. Schoefer, executive vice president and treasurer; J. D. Hagans, Ohio Steel Foundry Co., president; and J. W. McKay, American Cast Iron Pipe Co., vice president

STOP LOSING MONEY

- **on large matched plates**
- **on short run loose pattern work**



JOLT CAPACITY 1300 lbs.

SQUEEZE CYLINDER 18" Diameter
(20,000 lbs. squeeze @ 80 lbs. psi)

TABOR "233" . . . handles odd shapes at a profit

Long, narrow flasks, and other odd shapes, which don't "fit" on any machine, generally end up as floor work — at a loss!

The Tabor Model "233" is an *unspecialized* jolt-squeeze molding machine for unconventional flask sizes. Mount the loose pattern on matched plate and handle short runs in minutes, instead of hours.

20,000 lb. squeeze capacity permits use as conventional Jolt-Squeezer. Relief valve provided as standard equipment for use when full squeeze is not required.

Priced below specialized machines of same capacity. Pays for itself on the headache jobs that now cost you money. Write for specifications.

TABOR
TRADE 1884 MARK

TABOR MANUFACTURING COMPANY
Division of Turbo Machine Company
LANSDALE, PENNSYLVANIA

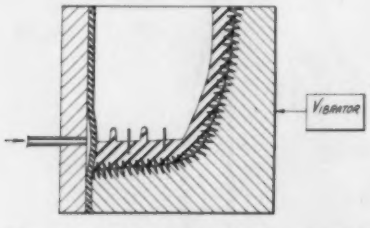
For More Information Circle 638, Page 87

PATENTS of INTEREST

Plaster Molding

Production of tire molds involves the use of formed metal strips called sipes, which form the intricate pattern of slots or grooves in the tire tread. Insertion of the metal strips in the plaster core is simplified and hand finishing is minimized according to this patent.

The method is to make a flexible resilient pattern of Korogel or similar material containing slots for insertion of the metal strips. This is



placed in a suitable box arranged so that pressure can be applied along one edge of the pattern. Metal strips are located in the slots and pressure applied which compresses the flexible pattern, holding the strips tightly in place. Plaster slurry is poured in the cavity and vibrated to remove any air bubbles. A few seconds later the pressure on the pattern is released permitting the soft plaster to follow the faces of the pattern.

The plaster, while soft, is sufficiently stiff so that it will not seep down into the slits around the metal strips. After the plaster sets, it is removed from the cavity, taking with it the metal strips or sipes. *Patent No.* 2,983,004 *granted to C. P. Spier and P. W. Wagner and assigned to Morris Bean & Co.*

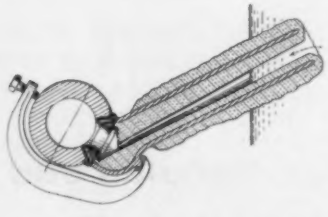
Fume Absorbent

Core oven fume absorbent solution is composed of neutralizer and detergent component, defoamant, corrosion inhibitor, and odor masking component. Neutralizer may be sodium carbonate, trisodium phosphate, sodium metasilicate, etc. Defoamant may be polypropylene glycol, silicone oil, etc. Corrosion inhibitor may be sodium or potassium dichromates or nitrites, and the odor masking component may be geraniol, geraniol butyrate, or geranyl acetate.

One formulation is given as 93 to 97.25 per cent sodium metasilicate, 0.25 to 1 per cent corrosion inhibitor, and 0.25 to 5 per cent polypropylene glycol. *Patent No.* 2,983,685 *granted to R. H. Harbin and assigned to Ajem Laboratories Inc.*

Hot Metal Feed Tube

Tube for conducting molten metal from the supply reservoir of a die-casting or other type of metal casting machine consists of a metal tube coated inside and out with a suitable insulating material such as silica. Passageway in the tube is tapered from bottom to top to reduce greatly the initial impact shock resulting from intermittent flow of molten metal which might loosen the insulating material. Insulation prevents solidification of metal in the tube. Movement of metal



through the tube is accomplished mechanically or by vacuum. *Patent No.* 2,977,649 *granted to G. R. Morton.*

Composite Casting

Method of providing a heavy cast layer of aluminum of substantial thickness integral with a ferrous metal body utilizes a fused flux composition. The flux has good wetting properties relative to the ferrous metal surfaces and will provide a layer of flux of sufficient thickness to blanket and protect them from oxidation prior to pouring of the aluminum.

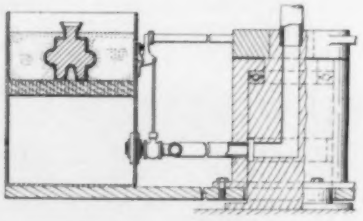
One flux composition contains about 27.5 per cent sodium chloride, 27.5 per cent potassium chloride, 20 per cent natural Greenland cryolite, and about 25 per cent zinc chloride. Bath is heated from 1330 to about 1400° F, the ferrous body immersed for 3 to 4 minutes, removed and placed in a mold. Aluminum is poured around it within 30 seconds. *Patent No.* 2,975,084 *granted to W. E. Jominy, J. H. Olson and R. B. Boswell and assigned to Chrysler Corp.*

Bearing Alloys

Material for bearing alloys is composed of 16 to 29 per cent aluminum, at least 2.2 per cent copper (copper being 0.1 to 0.25 the aluminum content), and the remainder zinc. Resulting alloys are heat treated at 300 to 525° F for 2 to 90 hours. *Patent No.* 2,982,677 *granted to E. Pelzel and assigned to Vereingte Osterreichische Eisen- und Stahlwerke A. G.*

Shell Mold Support

Apparatus and method for supporting and cooling of a shell mold during and/or after filling the mold with molten metal comprises a container divided into upper and lower chambers by a porous membrane. Upper chamber is open to the atmosphere and filled with a bed of fine grain heat conductive material such as metal grit, zircon, silica sand, etc. Shell mold is placed on top of



the bed and gas under pressure is introduced into the lower chamber. The gas permeates through the membrane and causes the material in the upper chamber to act like a liquid. This allows the shell mold to sink gradually into the floating

particles. When pressure is removed the particles return to a stable condition, surounding and supporting the shell. The mold is filled with molten metal. After a suitable cooling period the pressure again is applied and permits easy removal of the shell mold and its contents. *Patent No.* 2,985,929 *granted to R. T. Carter.*

Ductile Welding Rod

Improvements in gas welding of ductile or nodular iron are accomplished through use of a rod preferably containing 2.75 Si, 0.21 Mn, 3.62 TC, 0.040 P, 0.012 S, 0.067 Mg, and remainder Fe. The rod is used in conjunction with a flux composed of 60 to 80 per cent boric acid, 5 to 20 per cent anhydrous borax, and 10 to 30 per cent soda ash.

The flux also may contain 0.01 to 0.05 per cent by weight of manganese dioxide. It is reported that welded areas are uniform in hardness ranging from 277 to 280 Bhn, and the welds are free from objectionable porosity and oxide inclusions and have a coefficient of expansion substantially the same as that of the underlying metal. *Patent No.* 2,977,676 *granted to R. F. Sherwin and S. J. Marabella and assigned to Chicago Hardware Foundry Co.*

Pouring Ladle

Top-pouring ladle designed to prevent contamination of the metal stream with residual slag includes a tubular side spout situated below the top and above the usual metal line. Additionally, the top of the ladle in line with the pouring spout is capped to about one-third to one-half of the ladle diameter, and the lining is extended on that portion of the ladle. That prevents flow of metal from the ladle top when tilted.

The pouring spout is plugged with a heat-destructible material such as loosely packed paper, which prevents the molten metal from flowing through the spout when the ladle is tilted until a sizable body of metal covered with the slag forms over the spout. When the plug is disintegrated by heat of the molten metal, clean metal flows through the spout. *Patent No.* 2,967,339 *granted to J. L. Ma and C. R. Beamesderfer and assigned to Lukens Steel Co.*

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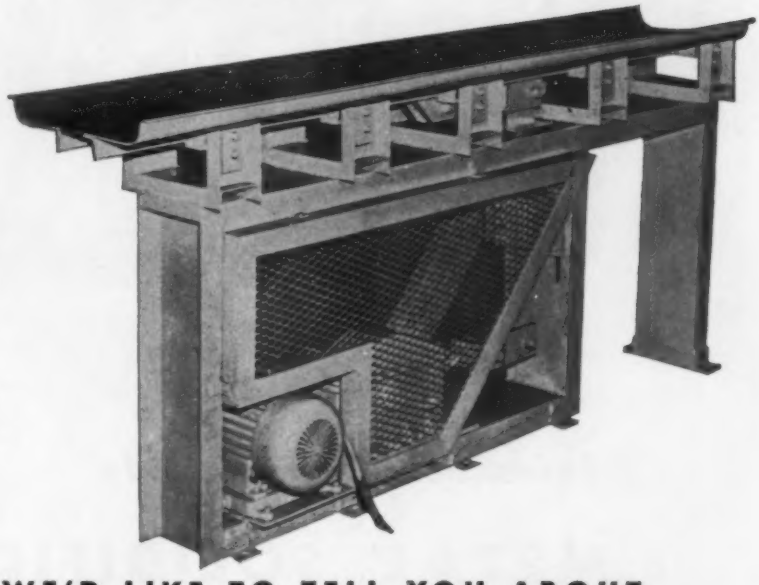
CONVEYERS



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LIVE-FLO units are oscillating conveyers of extremely simple design. They will negotiate turns and moderate grades, are unbelievably quiet in operation, and convey small parts smoothly and under complete control.

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These investment casters heard several papers on metal solidification at a seminar sponsored by the Investment Casting Institute at Case Institute of Technology

Investment Casters Study

METAL SOLIDIFICATION

By WALLACE D. HUSKONEN
Assistant Editor

● INVESTMENT CASTERS met June 20-21 at Case Institute of Technology, Cleveland, to discuss melting and solidification of metals, heat transfer, metal-mold reactions, gating and risering, and hot tearing at a technical seminar. The meeting was sponsored by the Investment Casting Institute in co-operation with Case.

Fundamentals of Melting and Solidification of Metals, by John F. Wallace, Case Institute. Removal of dissolved oxygen by deoxidation and of hydrogen by degassing are necessary to control porosity. Oxygen causes porosity by reacting with carbon, hydrogen, or sulfur to form carbon monoxide, water vapor, or sulfur dioxide. Thermodynamic considerations indicate that magnesium and aluminum require no deoxidation; copper-base alloys containing aluminum, titanium, silicon, or zinc are self-deoxidizing; and aluminum and titanium are good deoxidizers for iron. The CO boil deoxidizes steel.

Hydrogen causes porosity when more of it is dissolved in molten metal than is soluble after solidification. Hydrogen solubility in solid magnesium is high and that metal has no gas porosity problem, but aluminum and some copper-base alloys are subject to hydrogen porosity. Steel rarely shows gross porosity, but hydrogen causes embrittlement. Porosity and embrittlement can be prevented by reducing contact with water or hydrocarbons, by inert gas flushing, or by applying a vacuum during or after melting.

Grain refining is advantageous with aluminum, magnesium, and gray iron, and commercial grain refining is being developed for copper-base metals and other ferrous metals. Investment casters refine grain size by adding substances to increase nucleation and restrict grain growth rate. Other methods include mechanical vibration and rapid cooling.

Employment of Melting and Solidification Principles in Investment Casting, by Merton C. Flemings, Massachusetts Institute of Technology, Cambridge, Mass. Sources of gases in metals include the charge materials, moisture from wet charges or equipment, furnace gases, and atmospheric contamination. A standard precaution should be to dry and preheat everything that comes in contact with the molten metal.

Nitrogen and chlorine can be bubbled through aluminum, magnesium, and other metals to flush out hydrogen. This method is used for some steels, too, but the CO boil is employed in carbon steels.

Vacuum degassing accomplished by placing a crucible of molten metal in a vacuum chamber is effective for aluminum and magnesium, but apparently not effective with steel. The vacuum required to evolve the gas bubbles depends on gas content, metal density, depth of the metal bath, and relative difficulty in nucleating bubbles of the dissolved gas. Melting in an induction furnace and degassing by placing

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WITH DELTA *HIGH-SPEED* FURAN RESINS . . .

you can substantially reduce your core making costs compared to conventional methods and materials . . . speed your core production and eliminate, or minimize, costly time-consuming oven baking.

Cores will be stronger, have better dimensional stability and be more resistant to breakage during handling.

Cores made with Delta High-Speed Furan Resins have excellent collapsibility and much longer shelf life.

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Your Delta Foundry Technician will willingly cooperate with you in evaluating the use of DELTA FURAN RESINS in your core room. He will provide the necessary samples, literature for use, and counsel to enable you to get maximum results in your operations.

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a vacuum chamber over the furnace while power is maintained may become important in investment foundries.

Chemicals which react to form solid, liquid, or gaseous deoxidation products can be used. Examples include using zirconium to remove hydrogen from some magnesium alloys, adding phosphorus to copper alloys to remove oxygen, and deoxidizing steel by adding aluminum or silicon.

Aluminum alloys can be grain refined with additions of titanium or boron, but high melt temperatures can destroy their effect. Magnesium alloys which contain aluminum are grain refined by plunging carbon compounds such as hexachlorobenzene into the metal or by superheating to about 1650° F. Grain refiners for gray iron are graphitizers such as calcium-manganese-silicon alloy.

Thermal Events of Importance to the Investment Casting Process, by Clyde M. Adams Jr., Massachusetts Institute of Technology. Due to the lack of specific knowledge of hot mold investment casting, heat flow data from casting processes in general must be extrapolated to apply to this process.

Mold temperature affects the heat flow pattern in a mold in many ways. Freezing time is inversely proportional to the square of the difference between melting temperature of a metal and mold temperature. The heat of solidification from a casting must penetrate farther into a hot mold than it would have to in an equivalent cold mold. This means that the *relative* chilling effect of protruding areas, corners, and edges is greater in a hot mold than in a cold mold. Also, there is some delay in forming a solid skin of metal at the mold-metal interface in a hot mold, whereas this skin appears almost instantaneously in a cold mold.

Investment castings require slightly larger risers than sand castings, and equations are available to calculate their sizes. It is important to shield against radiation from an open-top riser or a combination riser-sprue since heat loss by radiation from them can be serious. Another factor to consider is that riser and casting solidify slowly if they are separated by only a thin layer of mold material which becomes saturated with heat from the molten metal.

Influence of Thermal Variables on Metal Flow in Investment Molds, by Hyman Rosenthal, Frankford Arsenal, Philadelphia. Metal flow in investment molds can be facilitated by a number of means: Prolonging fluidity by raising pouring temperature and by heating the mold; increasing effective metal by centrifuging, suction, and other casting techniques which raise metal velocity; and smoothing of the mold surface to reduce metal-mold friction.

Gating and Risering of Investment Castings, by Professor Wallace. A gating system should channel molten metal into the mold cavity without causing laps or misruns, damage to the mold, slag or dross formation, or gas cavities. Turbulence should be prevented by avoiding sharp changes in direction and cross-sectional area in the flow channel.

A recommended gating design consists of a tapered downsprue leading into a cylindrical bottom basin and a reverse-taper upsprue which has step gates along its length leading into the casting. Suggested ratio of the area at the bottom of the downsprue to the area at the base of the upsprue to the total ingate area is 1:4:3.

Riser size can be determined by using, as a rough guide, standard plots of relative volume of riser and casting versus the freezing ratio for the riser-casting combination. Effective areas of riser and castings must be estimated to account for restricted heat loss from the central sprue system used in investment casting. Riser necks usually serve as ingates and should be round and as short and thin as possible so that they will freeze after the casting, but before the riser. Feeding distance is the main criterion for location of risers.

Metal-Mold Reactions, by Lawrence H. Van Vlack, University of Michigan, Ann Arbor, Mich. An important metal-mold reaction is a thermal or fluxing reaction which occurs when a metal oxide dissolves the mold refractory to form a liquid which melts at temperatures equal to or lower than the metal melting point. Molten iron undergoes this reaction when there is excessive superheat, when iron oxidation by air has occurred, or when certain alloying elements are present. Aluminum and copper provide less opportunity than iron for fluxing at the metal-mold interface.

Several procedures can be used to avoid the metal oxidation which leads to the mold surface reactions. These include pouring under a vacuum, using an inert gas blanket in the mold, or casting iron and steel in thin shell molds which liberate volatile hydrocarbons to purge gases from the molds.

Additions of alloying elements such as manganese to steel can result in severe metal-mold reactions because manganese oxidizes more readily than iron, and the oxide readily fluxes silica refractories. Where oxygen cannot be avoided, and especially where alloying elements like manganese are used, refractories such as alumina and zircon might be used since they seem to exhibit lower solubilities in liquid oxides.

Cause and Prevention of Hot Tearing in Investment Castings, by John Zotos, Northeastern University, Boston. Hot tears are intergranular cracks developed in castings during solidification. All alloys except eutectics solidify over a temperature range, and the composition of the resulting solid varies as a function of decreasing temperature. The last liquid to solidify surrounds the metal grains as a film, and hot tearing occurs, if other conditions for its development are present.

As metals solidify and cool to room temperature, they contract considerably in volume or length. Ferrous alloys decrease in volume about 3 per cent and nonferrous alloys about 6 per cent. If this contraction is restricted by the mold, stress concentrations appear at hot spots, and hot tearing results if liquid films are present.

Hot tearing is minimized in both ferrous and nonferrous investment castings by the relatively low thermal gradients which are maintained by the heated molds. The low thermal gradients reduce the occurrence of hot spots and the attendant stress concentrations which might cause hot tearing.

Gating and Risering Practices for Ferrous and Nonferrous Investment Castings, a panel presentation by W. A. Dubovick, Engineered Pre-

cision Casting Co., Matawan, N. J.; R. Ostrowski, Gray-Syracuse Inc., Manlius, N. Y.; and C. H. Watts, Precision Metalsmiths Inc., Cleveland. The first two panel members presented slides depicting development of successful gating and risering on problem castings. Mr. Watts showed slides and described the hollow sprue system developed and used by his company.

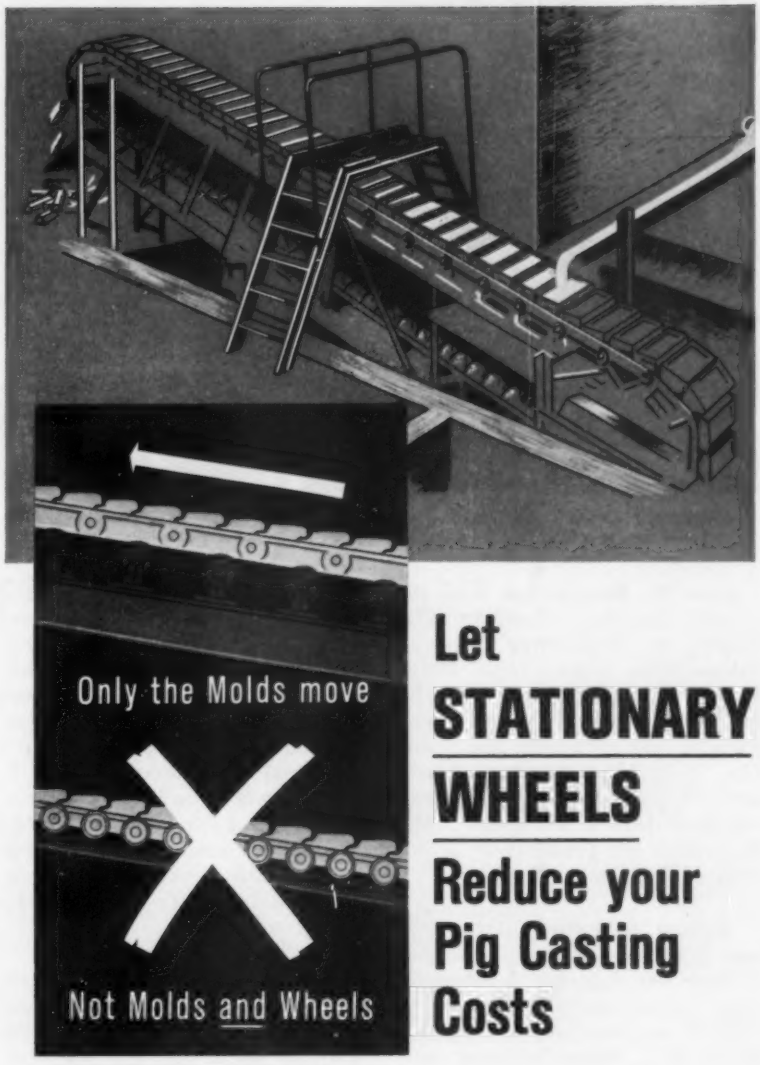
During an evening session on the first day, a movie entitled, "A Study of Vertical Gating" was viewed. This film showed the results of research by K. R. Grube and J. G. Kura at Battelle Memorial Institute which was sponsored by the American Foundrymen's Society. Gating practice recommended as a result of the study include the following: 1. Use a vertical, tapered sprue to the bottom of the casting. 2. Use a cylindrical basin at bottom of the sprue. 3. Make the area of the runner twice the area of the sprue. 4. Include an extension on the runner. 5. Vent the runner extension. 6. Gate into the bottom of a side riser. 7 Use a continuous web, between riser and castings, just big enough to allow metal flow but small enough to trap dross.

An informal progress report was presented on development of radiographic references for steel castings from $\frac{1}{8}$ to $\frac{3}{4}$ in. in wall thickness (see p. 167, FOUNDRY, April, 1961).

Apprentice Contest Produces First Canadian Top Winner

The first Canadian to win a top prize in the AFS Robert E. Kennedy Memorial Apprentice Contest for wood patternmaking is Wayne Belanger, Port Coquitlam, B. C. Wayne, who is 19, won his first place in nonferrous molding. He has worked for Bird Aluminum Foundry Ltd., Vancouver, B. C., for two and a half years.

For winning this award, Wayne will receive $100 in cash, a certificate, and a trip to an AFS Congress to receive these awards. Rather than receive his awards at the 1961 San Francisco Congress, Wayne chose to wait until 1962 for the International Congress in Detroit. The British Columbia Chapter of AFS also recognized Wayne's achievement by presenting him with a membership.



Let STATIONARY WHEELS Reduce your Pig Casting Costs

Eliminating 80% of the parts of conventional pig casting machines, this simplified design results in sharp reductions of lost production time and maintenance costs. Since the idler wheels are mounted on anti-friction bearings on the stationary part of the frame, not on the molds, they are positioned as far as possible from hot metal.

Capacities for the machine illustrated: from 3 to 50 tons per hour. Sizes: 15 to 125 feet. Other Bailey Pig Machines are made in single and double strand types and in capacities to 250 tons per hour. Both types feature stationary wheel construction.

WILLIAM M. Bailey COMPANY
ENGINEERS
LEADERSHIP THROUGH QUALITY
1221 BANKSVILLE ROAD PITTSBURGH 16, PA

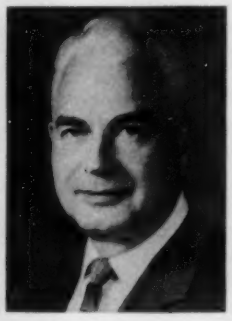
For More Information Circle 641, Page 87

MEN of INDUSTRY

EARLE W. REARWIN
. . . die casting pres.

ROY WILLISON

ROBERT C. LEWIS



R. G. PARKS

. . . promotions at National Castings Co.

ROBERT C. JOHNSTON
. . . AFS chapter chairman

Earle W. Rearwin has been appointed president, Southern Die Casting & Engineering, Div. of Adams-Millis Corp., High Point, N. C. For the last four years he has been chief engineer, Reed Prentice Div., Package Machinery Co., East Long Meadow, Mass., and will continue on the engineering staff there as an advisor. Mr. Rearwin is vice president of the Society of Die Casting Engineers.

Bertram S. Parker, since 1954 vice president-general manager, Youngstown Foundry & Machine Co., Youngstown, Ohio, has been elected president, succeeding his father, **B. G. Parker,** president since 1930, and now chairman.

Charles A. Stone has been named marketing manager for the Chicago and Bridgeport, Conn., sales organizations, Stewart Die Casting Div., Stewart-Warner Corp., Chicago. He joined the company in 1937.

Frank J. Durzo, since 1958 vice president - manufacturing, Jeffrey Mfg. Co., Columbus, Ohio, has been made executive vice president, replacing **C. J. Leifeld** who has held the position ten years. Mr. Durzo joined Jeffrey in 1947, Mr. Leifeld in 1916.

Richard E. Button has been appointed vice president-general manager, Regent Die Casting Co., Chicago. He was with Central Die Casting & Mfg. Co., there.

R. G. Parks has been elected a vice president, National Castings Co., Cleveland. He will continue as treasurer, a position he has held since 1954. **Roy Willison** has been appointed vice president and general manager of the company's Industrial Div., succeeding **Roy C. Hobson,** who is on leave of absence. **Robert C. Lewis** takes over Mr. Willison's former duties as controller. Mr. Lewis has been controller of National's Phoenix, Ariz., Works since 1959.

Lyman D. Ketchum, formerly with Spencer Kellogg & Sons, Kansas City, Mo., has been named sales manager of the corn mill operation, General Foods, Kankakee, Ill., succeeding **Ross Barzelay** who becomes operations manager for the company's Kankakee operations Aug. 15.

A. J. Fehr has been appointed Cleveland sales manager, Farrel-Cheek Steel Co., Sandusky, Ohio, including Erie, Pa. He has been with the company over 25 years.

George F. Delavie, formerly production manager, Taylor-Boggis Foundry, Euclid, Ohio, has been named a technical service representative, Ralph Peckinpaugh & Associates, Cleveland.

Stuart D. Walker has been named New England district manager of a sales office recently opened in Dedham, Mass., by Hevi-Duty Electric Co., Watertown, Wis., Div. of Basic Products Corp., Milwaukee. He was in the Little Ferry, N. J., office. **Richard G. Vossler,** from the Little Ferry office, has been transferred to the New England district with headquarters in Hazardville, Conn.

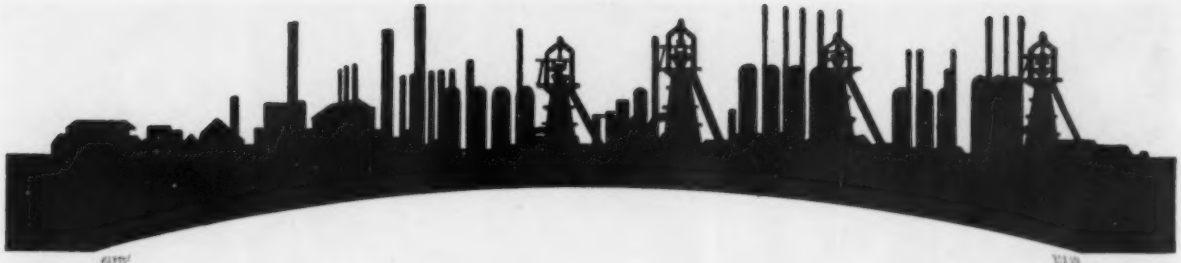
Robert C. Johnston, elected president of the Chicago Chapter of the American Foundrymen's Society for 1961-62, for the last five years has been resident manager in the home office of Hickman, Williams & Co., Chicago.

Maynard H. Patterson, formerly with Bridgeport Brass Corp., Adrian, Mich., has joined Rimer Precision Castings Inc., Waterville, Ohio.

W. R. Ramsay has been elected first vice president, **E. A. Williams Jr.** vice president-operations, and **Frederic W. Schroeder** vice president-research, North American Refractories Co., Cleveland.

Victor L. Persbacker, comptroller, American Brake Shoe Co., New York, has been re-elected treasurer of the Controllers Institute of America, New York.

Chester J. Schmidt has retired as vice president - general manager, J. O. Ross Engineering Div. of Midland-Ross Corp., Cleveland, and will continue in an advisory capacity. **Robert J. Jacobs** will assume general management duties for the Ross Div. temporarily in addition



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Many of Woodward's foundry customers have been on the Company's books continuously for more than half a century.

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. . . becomes plant mgr.

E. R. BELLOWS

B. P. HAMMOND
. . . changes at Blaw-Knox

THOMAS A. CLAIBORNE

JAMES C. HOLWAY
. . . Tennessee Products appointments

to his duties as vice president-general manager of the Waldron-Hartig Div.

James W. Hill has been made plant manager, Bartlett-Snow Div., Bartlett-Snow Pacific, Cleveland. He joined Bartlett-Snow in 1927 and became plant superintendent in 1942.

Leonard Schweitzer has been reassigned to handle carbon product sales to steel mills and foundries in the Cleveland, Beaver Valley, Pa., and Pittsburgh area, for Speer Carbon Co., St. Marys, Pa. He joined the company three years ago.

Gilbert R. Rothschild, since 1957 assistant director, metallurgical research, Air Reduction Co., New York, has been named assistant director of metallurgical development, heading a new division of the company's Central Research Laboratories, Murray Hill, N. J.

Nick G. Lirones has been appointed development project engineer, Misco Precision Casting Co., Div. of Howe Sound Co., Whitehall, Mich. He joined the company in 1956.

E. R. Bellows has been appointed manager of eastern castings sales, Foundry & Mill Machinery Group, Blaw-Knox Co., Pittsburgh, succeeding **B. P. Hammond,** a vice president, who has retired. Mr. Hammond was a vice president with Continental Foundry & Machine Co., when it was acquired by Blaw-Knox in 1955. Mr. Bellows has been Mr. Hammond's assistant for the past year.

Fred H. Edgar has been made vice president-aluminum sales, Metals Div., Olin Mathieson Chemical Corp., New York, succeeding **Derek Richardson,** who becomes vice president-marketing for the Chemicals Div. Mr. Edgar is currently director of aluminum extrusion operations. Other appointments in the Metals Div. include: **Edward B. Reynolds,** previously northeastern regional sales manager, now assistant director of aluminum field sales in New York; and **Charles I. Vogel,** southeastern regional manager, who has been made manager of the new eastern sales region, with headquarters in Philadelphia.

Roy Perler, formerly regional sales manager in northeastern United States and Canada, Yale Materials Handling Div., Yale & Towne Mfg. Co., Philadelphia, has been named manager of the New York sales-service branch.

Thomas A. Claiborne has been named general sales manager, Alloy & Metals Div., Tennessee Products & Chemical Corp., Nashville, Tenn. He was southwest regional sales manager in Houston for Tennessee Products and its subsidiary, Tenn-Tex Alloy & Chemical Corp., and serves as vice president of the two. **James C. Holway** has been named manager of the Detroit sales district recently formed by the parent company. He was a sales representative there for Tennessee Products.

W. V. Raszka and **J. F. Colosimo** have been appointed sales engineers, Welding Products Div., A. O. Smith Corp., Milwaukee, in the mideast and Detroit districts, respectively. Mr. Raszka was production manager for Budd Co., Detroit. Mr. Colosimo recently was graduated from Notre Dame University.

John K. Foster, since 1957 senior vice president, has been elected ex-

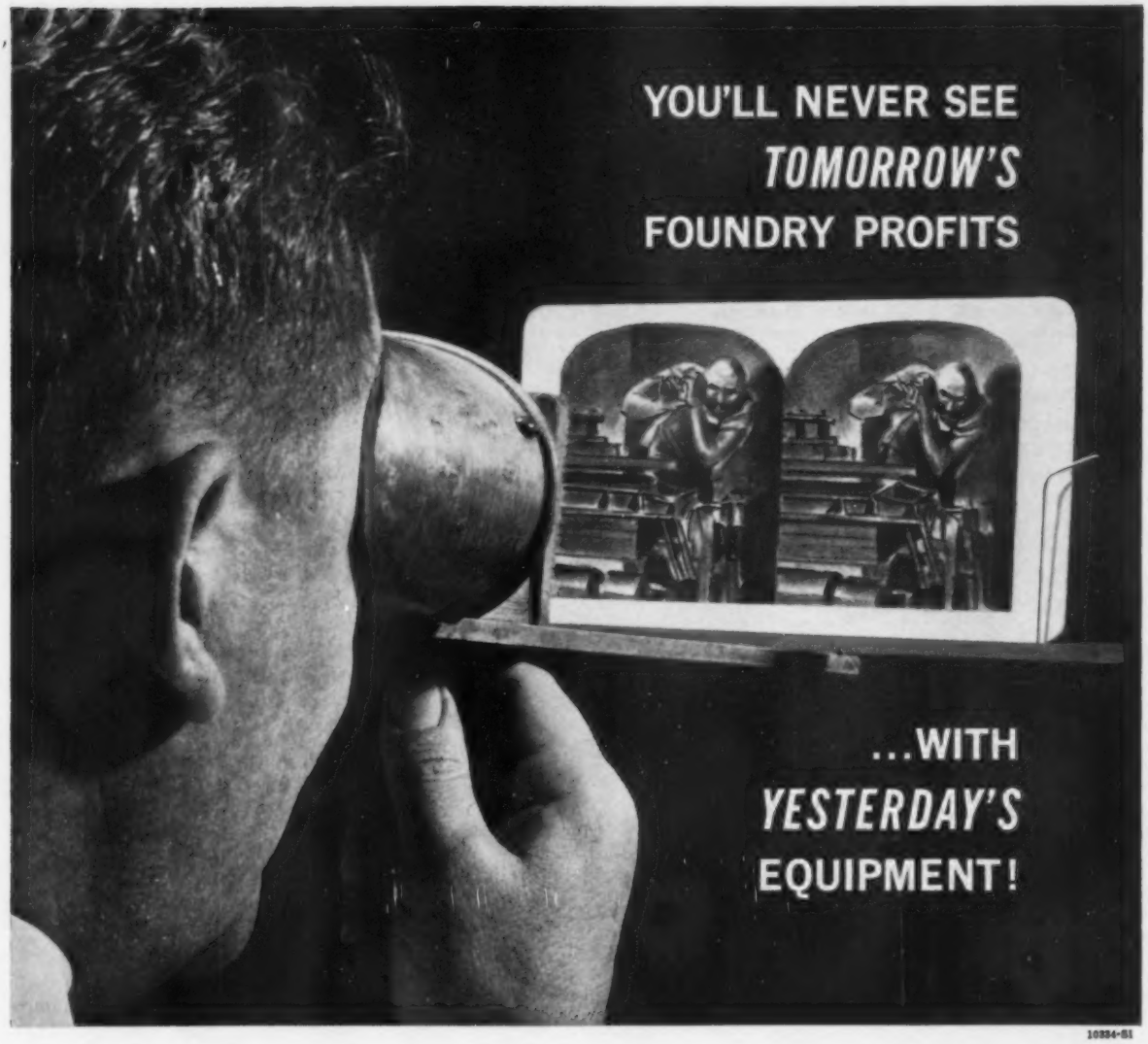
NICK G. LIRONES
. . . project development

FRED H. EDGAR

DEREK RICHARDSON
. . . Olin Mathieson promotions

J. F. COLOSIMO

W. V. RASZKA
. . . A. O. Smith Corp. sales



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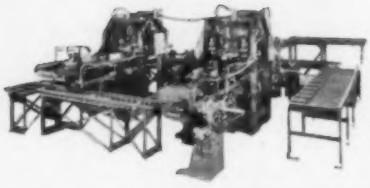

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For More Information Circle 643, Page 87

DONALD BURTNER
. . . quality control mgr.

CHARLES D. CHAMBERLIN
. . . joins Newaygo Eng. Co.

RONALD F. ALTOBELLI
. . . joins Planet Corp.

DONALD W. BODENE
. . . joins Beryllium Corp.

STANLEY M. HUNT
. . . district sales mgr.

ecutive vice president, Shenango Furnace Co., Pittsburgh. He joined the company in 1940 as assistant secretary.

Donald Burtner and **John Hill** have joined Pittsburgh Metals Purifying Co., Mars, Pa., subsidiary of Treesdale Laboratories Inc., Pittsburgh. Mr. Burtner, who was general manager of aluminum smelting, Rock Creek Aluminum Co., Rock Creek, Ohio, has been named manager of quality control. Mr. Hill, formerly assistant chief metallurgist, Heppenstall Co., Pittsburgh, joins the company as sales engineer.

Charles D. Chamberlin, recently with Simplicity Engineering Co., Durand, Mich., has joined Newaygo Engineering Co., Newaygo, Mich., as district manager of the central region, with headquarters in southwestern Ohio.

Ernest A. Nelson has been named assistant to the Los Angeles branch manager, Fuller Co., Catasauqua, Pa., in the Compton, Calif., office.

John D. Pizzini has been appointed technical sales representative, Foseco Inc., Cleveland, to cover eastern Maryland, Delaware, District of Columbia, southern New Jersey and eastern Pennsylvania.

Ronald F. Altobelli has joined Planet Corp., Lansing, Mich., as a sales engineer for automated foundry material handling equipment. Mr. Altobelli formerly was associated with Jeffrey Mfg. Co., Columbus, Ohio. He is an industrial engineering graduate of Pennsylvania State University.

Kenneth R. Geist, since 1950 director of purchases, Allis-Chalmers Mfg. Co., Milwaukee, has been appointed general manager of its new Special Products Dept. **Fred J. MacDougall** becomes director of purchases.

John J. Farrell, formerly with Vanadium Corp. of America, New York, has joined the sales staff of Shieldalloy Corp., Newfield, N. J.

Warren N. Pollock has joined Clearfield Machine Co., Clearfield, Pa., as general sales manager.

A. W. Ostberg has been named manager of warehouse distribution, Link-Belt Co., Chicago, with headquarters at the executive offices there. He was a company distributor representative for the last three years.

Donald W. Bodene recently joined the Product Development Dept., the Beryllium Corp., Reading, Pa., where he will be responsible for development of beryllium copper casting applications and introduction of new foundry procedures. He was chief metallurgist, Rolle Mfg. Corp., Lansdale, Pa.

Stanley M. Hunt will head the district sales office recently opened in Hartford, Conn., by Acheson Colloids Co., Port Huron, Mich. He will be responsible for marketing development in New England.

Clifford Amend, formerly with Pittsburgh Commercial Heat Treating Co., Pittsburgh, has been named metallurgist, Ajax Magnethermic Corp., Youngstown, Ohio.

Kenneth S. Cowlin, for the last eight years sales manager of the Grinding Wheel Div., Electro Refractories & Abrasives Corp., Buffalo, N. Y., has been named general sales manager of the company.

ERNEST A. NELSON
. . . joins Fuller Co.

JOHN D. PIZZINI
. . . joins Foseco Inc.

A. W. OSTBERG
. . . Link-Belt mgr.

CLIFFORD AMEND
. . . metallurgist, Ajax

KENNETH S. COWLIN
. . . general sales mgr.

OBITUARY

Harold W. Wheeler, 50, who left foundry personnel work early this year to join the sales force of Schmeller Aluminum Foundry Co., Cleveland, died June 22. He was in charge of personnel for Superior Foundry Inc., there, and later served in a similar capacity with Allyne-Ryan Foundry Co., Cleveland.

Harvey L. Lee, 63, regional sales manager in Cleveland for Foxboro Instrument Co., Foxboro, Mass., died June 25. He joined the company 30 years ago.

George M. Ullom, 55, Birmingham district sales manager, Harbison-Walker Refractories Co., Pittsburgh, died May 13. He joined the company in 1929 and previously served in the Portsmouth, Ohio, and Kansas City sales offices.

William E. Sloan, 94, founder of Sloan Valve Co., Chicago, died June 25 in his home at Coral Gables, Fla.

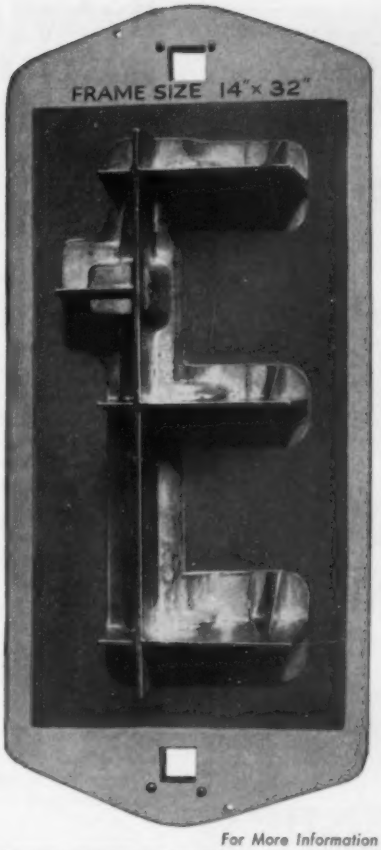
Milton G. Lehman, 81, founder and president, United Bronze of Pittsburgh, Pittsburgh, died June 30.

Book Review

***ASM Review of Metal Literature, 1960,* edited by Marjorie R. Hyslop, cloth, 1421 pages, 6 x 9 in., published by the American Society for Metals, Novelty, Ohio. Price $25.**

This book is volume 17 of the American Society for Metals' series reviewing literature pertaining to the field of metals. It contains nearly 12,000 brief abstracts from articles, technical papers, reports and documents which appeared in engineering, scientific and industrial journals and books throughout the world during 1960.

The volume is divided into 20 sections covering different areas of materials, process engineering, and technology. The section devoted to the foundry field contains over 750 items. The book has an extensive subject index, an author index, and other information.



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The Drier pattern at left is for air intake diesel manifold made from an original master pattern. *Only one skrinkage!* Material is aluminum. Pattern was used for 50 Driers. Only 3 hours labor and 35 pounds of TAMASTONE were required. Up to 1,000 castings have been made from a plate of this type!

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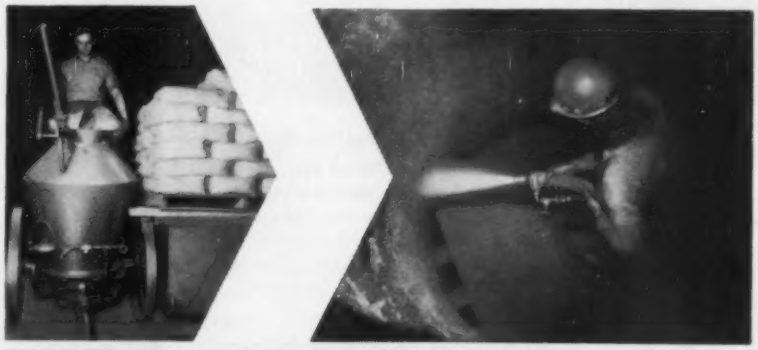

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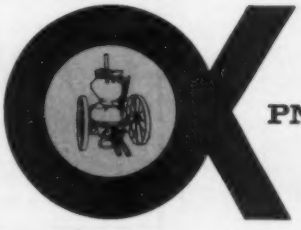

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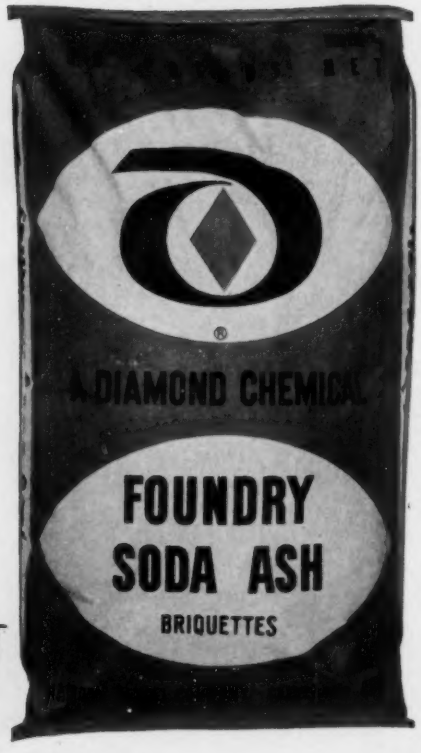
NEW



DIAMOND FOUNDRY SODA ASH BRIQUETTES

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No inactive ingredients to add to cost. Pillow shaped for easy handling and fast, efficient desulphurization of molten metal in cupola or ladle. Diamond Foundry Soda Ash Briquettes permit greater use of scrap metal in melting, release entrapped gases and increase fluidity. Tough, moisture-proof 100-lb. bags keep them dry, effective and safer to use.

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421 Hanna Bldg. Cleveland 15, Ohio SUperior 1-8683	1006 Main St. Houston 2, Texas FAirfax 3-7329	99 Park Avenue New York 16, N. Y. OXford 7-0440

Other Diamond Chemicals for the foundry: MOROC, silicate CO_2 binder, Caustic Soda, Chlorine, Solvents

Diamond Chemicals

For More Information Circle 646, Page 87

Hydrogen Content Control REDUCES REJECTS with One Minute Foundry Test

Rejection of aluminum alloy castings, due to porosity, can be reduced through the use of one or more "HYCON TESTERS" in your foundry. The MEL model 5203 HYCON TESTER uses the "Initial Bubble Principle" to determine hydrogen gas content in molten aluminum alloy to an accuracy as close as ± 0.05 ml $H_2/100g$. Immediate and accurate control is thus available *before* casting. A simple operation requires but a minute. A small amount of molten alloy is ladled into the pre-heated electric crucible and pressure reduced at a controlled rate. When first bubbles break surface, temperature and pressure are noted and referred to a nomogram for precise hydrogen content reading.

A foundryman can make the test quickly and accurately with MEL model 5203 HYCON TESTER.

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For More Information Circle 647, Page 87

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CONTROL SYSTEMS . . .	ERATION MODERNIZED

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For More Information Circle 648, Page 87

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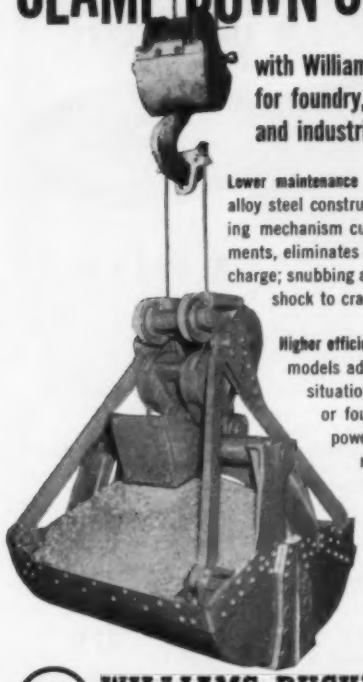
CLAMP DOWN ON COSTS

with Williams Hook-On Buckets for foundry, steel mill, and industrial service



Lower maintenance costs: clean-cut design, alloy steel construction; sureness of latching mechanism cuts downtime for adjustments, eliminates danger of accidental discharge; snubbing action minimizes opening shock to crane.

Higher efficiency: open or closed-head models adaptable to all headroom situations; can be reeved three or four parts of line for fast, powerful bites; automatic or manual trip; medium or heavyweight models for all types of service.

If you have special requirements for buckets, let our engineers discuss them with you.

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THE WELLMAN ENGINEERING CO.
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For More Information Circle 650, Page 87

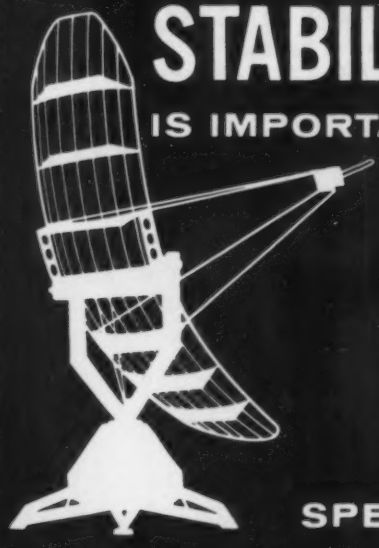
Let us know your specifications on welded constructions. We have up-to-date facilities for production of carbon or stainless steel and aluminum, from 1/16″ to 4″ thick.

Call or write for estimate. You'll find it economical to work with us on your requirements for tanks, chutes, hoppers, machine bases, stacks, breechings, angle rings, special cars, buckets and other equipment.

PENN IRON WORKS, INC.
READING, PA. Phone FRanklin 6-4826

For More Information Circle 651, Page 87

WHERE
DIMENSIONAL STABILITY
IS IMPORTANT...



SPECIFY
PRECEDENT 71
ALUMINUM CASTING ALLOYS

DIMENSIONALLY STABLE TO 0.00001″ PER INCH

Parts in computing devices, aircraft or missile guidance systems, and electronic equipment must be dimensionally stable, sometimes to a few millionths of an inch per inch. Two factors interfere with such dimensional stability: (1) locked-up stresses and (2) growth. While there are many approaches to the solution of this problem, most involve a lot of time and trouble, but contribute little to stability of parts.

The most positive solution is the use of Precedent 71 aluminum casting alloys which may be stress relieved by heat treatment at 700°F for four hours followed by cooling in still air. This stress relieving heat treatment is applied to the raw casting and no subsequent treatment is required. After stress relieving at 700°F, Precedent 71 A and B alloys are completely dimensionally stable to 0.00001″ per inch.

Write for Free Bulletin

WILLIAM F. JOBBINS INCORPORATED

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P. O. BOX 230B
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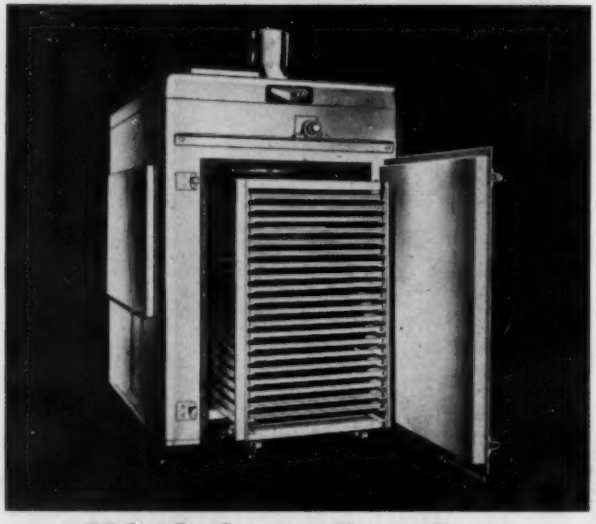
NEW METHODS



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MOCO

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GRINDING WHEELS

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A DIVISION OF ABRASIVE PRODUCTS, INC.
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CONES • PLUGS • MOUNTED WHEELS AND POINTS

For More Information Circle 654, Page 87

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HIGH QUALITY • LOW ALUMINA

FINELY GRADED TO DESIRED SIZE

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A Better Way to prepare molding sand!

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STATES ENGINEERING CORP.
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For More Information Circle 653, Page 87

For More Information Circle 656, Page 87

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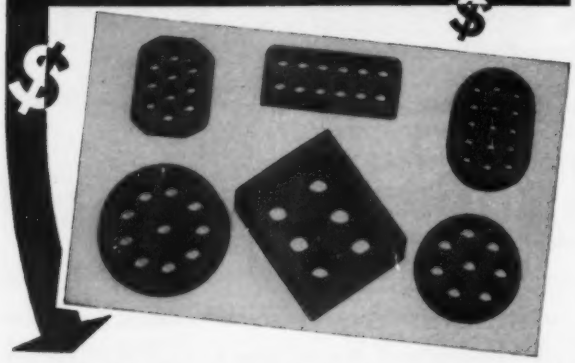

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For More Information Circle 657, Page 87

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problem?

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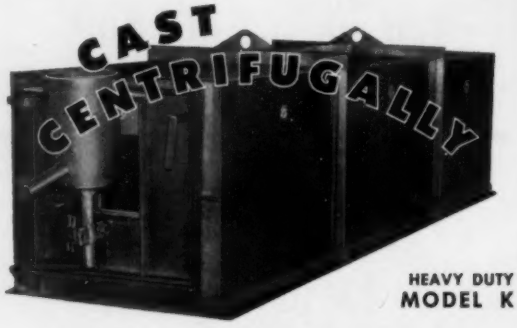
Name _____

Company _____

Address _____

City _____ Zone _____ State _____

For More Information Circle 659, Page 87



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For More Information Circle 660, Page 87

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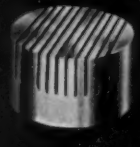
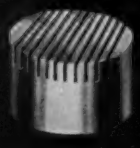
For More Information Circle 661, Page 87

SLOTTED CORE BOX VENTS



X-TRA DEEP HEAD .156 Wide Slots .014

SHALLOW HEAD .031 Wide or Narrow Slots .014 .010



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- FOR CLEANING SLOTS
- MADE OF TEMPERED STEEL
- EASY TO USE

For More Information Circle 662, Page 87

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By Harry M. St. John

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For More Information Circle 667, Page 87

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Flexible TEXTILE Core Vent
New venting material for sand cores. Disintegrates completely if core is baked . . leaves no residue. Allows unrestricted use of cold-setting processes.
DOMESTIC industries inc.
470 W. Broad St. Columbus, O.

For More Information Circle 668, Page 87

HARTLEY CONTROLS CORPORATION
NEENAH • WISCONSIN
Originators of Fully Automated Sand Systems for Foundries

For More Information Circle 669, Page 87

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Excellent opportunity for person experienced in sales management of custom castings, forging, or mechanical components, through manufacturer's representative to customers in heavy industry. Must assume full responsibility for sales management including market analysis, advertising, promotion, sales administration and management of field sales force for long established firm with about $5,000,000 annual sales. Mechanical engineering background desirable but not as important as comprehensive industrial marketing abilities. Salary and incentives. **Please send resume to:**

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Rapidly growing precision casting firm offers these challenging opportunities for young men with imagination and drive.

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Will have complete responsibility for the development of all new production jobs, including tooling, gating, sample runs, etc. Will also be responsible for metallurgical work in casting and heat treating departments. Degree in metallurgy and foundry gating experience necessary for qualification. Work is related to ferrous, nickel, and cobalt base alloys, both air and vacuum melt.

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This position, reporting to the Production Manager, involves the supervision of all production departments. Several years of successful experience in direct production supervision is required. Steel foundry experience, and particularly investment casting experience, desired. Excellent working conditions—profit sharing—opportunity to live in the great Northwest.
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Progressive midwest malleable jobbing foundry needs foreman with experience in an incentive shop. Must have a background of working out production problems with oil sand as well as shell and CO_2. Age 30-45. Send complete resume to: Box 125, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Foundry Metallurgist

Metallurgical degree, will assume responsibility of melting, heat treating, laboratory and sand control.

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To take full charge of Inspection Department and set up quality control program.

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Experienced in gating and risering, efficiency costs, to take full charge of 120 employee department.

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Excellent opportunity for efficient and successful man of experience in both miscellaneous and semi-production steel and alloy casting up to 18,000 lbs. Must have know-how to operate foundry efficiently and successfully in getting low man-hours, highest yield, minimum scrap, etc. Have full Union cooperation, like management, wants results. Employees know of this ad. Only qualified need answer with complete resume, references and education. Address: Box 136, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Sales engineer with technical background, willing to travel. Well established products in steel foundry and heat treating fields. Send resume and salary requirements. Address: Box 144, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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For gray iron in medium size gas fired melting furnace, for a jobbing foundry in north central Ohio. Preferably someone who also has some cupola melting experience. Address: Box 123, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Confidential Inquiries Invited

From Employers and Qualified Applicants

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DRAKE PERSONNEL, INC. **FINANCIAL 6-8760**

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Metallurgist with excellent foundry background and good management experience seeks opportunity with growing, progressive foundry. Experience includes foundry supervision and management, production control, quality control, purchasing, research, plus early trades training. Present earnings in low five figures. Address: Box 149, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Young man; experienced supervisor; good foundry background; wood, metal and plastic pattern experience. Address: Box 137, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Experience in all duties of management including time-study and incentives. Aluminum and gray iron foundry experience. Resume sent upon request. Address: Box 146, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

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Qualified-Progressive!

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Thirty-five years' Experience
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REPRESENTATIVE WANTED

Well equipped brass and bronze foundry desires sales representative for Pennsylvania, New Jersey, Maryland area. Please state current representation and area now covered.

BOX 135, FOUNDRY

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WANTED TO BUY

WATER WORKS FITTINGS patterns: mechanical joint, lead joint, Ringtite and Fluidtite. Please contact . . . Address: Box 118, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

• FOUNDRY FOR SALE

FOR SALE

Complete small Shaw foundry. Melting furnace, bake-out oven, alloy steels, refractories, chemicals, ready to set up and produce castings up to 40 pounds. List on request. Address: CHARLES ZAPF AND COMPANY, 2423 Main Street, Evanston, Illinois. DAVIS 8-0333.

FOR SALE

Medium Size

Western

Steel Foundry

• Good Business

• Good Location

• Good Profit Record

HARBOR INVESTMENT COMPANY
308-30th STREET
NEWPORT BEACH, CALIFORNIA

FOR SALE OR LEASE

Steel Foundry, heat treating, machine and fabrication plant. Completely mechanized with sand system, molding machines and sand hoppers for production molding and coremaking. Capacity 150 tons castings per month. Location West Coast.

BOX 187, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

• FOR SALE

SHELL CORE MACHINES

2—SPO SC-30A-1 fully automatic Holo Core Machines.

Used 1½ years. Excellent condition.

18 x 22 gas fired platen. .....$3500.00 each.

NOBLESVILLE CASTING CO., INC.
NOBLESVILLE, INDIANA

• FOR SALE

FOR SALE

SANDSLINGER (B&P) Stationary 16 x 4—Rebuilt and Guaranteed.

45" MAGNET (Bolted) *Reasonable.*

CORE OVEN (Young Bros.) 36" x 48" 4 drawer, recirculating, gas fired. Guaranteed.

MULLOR (B&P) #30 Speedmullor w/skip loader, rebuilt and guaranteed.

CORE OVENS (PORBECK) 2 double drawer type, 5 drawers each; 48 x 60, gas fired, recirculating. Guaranteed.

We lean over backward—or forward—to please you!

McMAHON AND COMPANY, INCORPORATED
P. O. BOX 3014A AVONDALE STATION
BIRMINGHAM 12, ALABAMA
PHONE—592-4201

SWING GRINDERS
FOR SALE
(Used—Excellent condition!)

FOX 10 hp. 3/60/220/440 volt takes up to 18" x 2" wheel $650.00

MARSCHKE 15 hp. 220-440 V. takes up to 24" wheel .....$750.00 each

C. GREENE EQUIPMENT CORP.
4014 W. 24th ST.
CHICAGO 23, ILLINOIS
LAFAYETTE 1-1322

REPAIR AND REBUILDING SERVICE ON ALL PNEUMATIC TOOLS

We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of renewing them with our Hard Chrome Process?

CENTRAL PNEUMATIC SERVICE, INC.
512 LINDEN AVENUE
DAYTON 3, OHIO
PHONE: CL 2-2701

REVERBALE JR.

Type 1, 14" basin melting furnace. Complete with Minneapolis-Honeywell automatic temperature control. For gas or oil firing. Spare set of bricks included. Price $1500. Address: Box 115, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

G-U-A-R-A-N-T-E-E-D
SAND BLAST EQUIPMENT
SELL BUY TRADE
TERMS AVAILABLE
Designers and Erectors of Specialized Blast Equipment

14' Wheelabrator Table Blast Model 4 with 4-66" Spin Tables like new	$10,000.00
4' Wheelabrator Table Blast	2250.00
6' Wheelabrator Table Room	6000.00
6' Wheelabrator Air Table	1700.00
48 x 48 Wheelabrator Tumblast	3000.00
42 x 48 Wheelabrator Tumblast	2750.00
36 x 42 Wheelabrator Tumblast	1500.00
4' Sly Air Table	600.00
27 x 36 Wheelabrator like new	3000.00
Sly Air bbl #4	350.00
9 LG Pangborn Table w/6-36" Spinners	$4000.00
6' Pangborn Swing Table, Like New	6000.00
Pangborn 53 EN-2 Hand Cabinet	325.00
Rumelin 8 x 8 Room	1000.00
Pressure Tanks, all types	$150.00 up
Vapor Blast Cabinets	400.00
Vapor Blast Automatic Table	2500.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure Tanks, Rooms, Horizontal or Vertical Tumbling Barrels and Additional Sand Blast Equipment too numerous to mention.

$100,000 worth of Wheelabrator and Pangborn Spare Parts Priced 25% to 50% Less List.

170 STEEL SHOT MIXED WITH G80

STEEL GRIT .....$125.00 ton

DIAMOND SAND BLAST EQUIPMENT CO.
5654 W. Jefferson Ave.
DETROIT 9, MICHIGAN
VI-3-6750

FOR SALE

AMERICAN MODEL "AA" SANDCUTTER—4' 8", No. 906. Can be inspected in operation. Any reasonable offer accepted. Address: 1014 West 12th Street, Erie, Pennsylvania. PHONE GLENDALE 6-2038.

• FOR SALE

- **WHITING** Cupola, 17 Tons, 1954
- **WHITING** Cupola Charger, 5 Tons, 1954
- **PANGBORN** Blast Cleaning Room, 16' x 16' x 11', 1948
- **PANGBORN** Rotoblast 32" diam. x 54" wide, 1948
- **ALLIS - CHALMERS** Foundromatic Shakeout, 25 tons, 8' x 10' deck, 1957
- **AMERICAN** 32,000 CFM Roto-clone dustcollector, 1957

!EXCELLENT CONDITION!

Murray Grainger
CAPITAL EQUIPMENT CORP.
40 Walnut Street Newark 2, New Jersey
PHONE: MArket 2-5222

FOR SALE

WHEELABRATOR Tumblast 36" x 42"	
WHEELABRATOR Cabinet Roller Conveyor System	
PANGBORN EN2 Cabinet	$260
TABOR 10" Jolt Pin Stripper	$225
TABOR 10" Molding Machine	$ 75
AMERICAN ROTOCLONE 2500 C.F.M. Sludge type 5 H.P. Motor Blower	$350
Flasks 52"x40" 12"/24"	$ 60
Round Flasks 48" x 48"	$ 30
Round Flasks 30" x 30"	$ 20
Dust Collectors, Riddles	

M. ELSTEIN
426 GRAND STREET
JERSEY CITY, 2, NEW JERSEY

FOR SALE

TUMBLAST WHEELABRATOR—36 x 42, Serial No. A-13364. Can be inspected in operation. Any reasonable offer accepted. Address: 1014 West 12th Street, Erie, Pennsylvania. PHONE GLENDALE 6-2038.

FOR SALE

36" x 42" AMERICAN WHEELABRATOR, Serial No. A63692; PANGBORN Table Blast with 6, 24" tables. Address: WELDON F. STUMP, 4835 Crestridge, Toledo 13, Ohio.

USED SAND LABORATORY EQUIPMENT

24" SIMPSON Muller; DIETERT Core Oven—220 V. single phase; REDFORD Core Blower; Porosity Tester; Gas Determinator; DIETERT Tensile Tester complete; COMBS Gyratory Sifter with screens; DIETERT Perm. Testers; Sample Dryer; Green Strength Tester; JONES Splitter (no pails); Sand Rammer. Price $1435.00 f.o.b. Chicago, Illinois.

May be inspected.

BOX 120, FOUNDRY
PENTON BLDG., CLEVELAND 13, OHIO

FOR SALE

MELTING FURNACES

$200.00 each—F.O.B Arkansas

Dimensions: Outside — 34½" diameter x 35" deep
Inside — 21½" diameter x 31" deep

Units complete including lining, thermocouple and protection tube, Hauck #780 Proportioned burner assembly—Burner, oil pressure regulator, oil filter, oil pressure gage, micro-regulating valve, oil shut off valve, air shut off valve.

Manufacturer—Hausfeld.
Designed to hold 130 pounds of Magnesium.
21 units available.

SABIN METAL CORP.
310 MESEROLE STREET,
BROOKLYN 6, NEW YORK

FOR SALE

Reda Furnace, 1000 Series, Like New

JENSEN BROS. MFG. CO., INC.

COFFEYVILLE, KANSAS

FOUNDRY EQUIPMENT

Simpson Muller Ser. 113155—1-F-UD 1955 — C/W — Skip Hoist, Water Meter; T. E. Mtr. 7½ HP—220/440—1750 RPM.

Beardsley & Piper #50-A Speed Muller Ser. 215-5406—C/W Skip Hoist, Water Meter, Etc., Installed 1955 9 cu. ft. Cap. T.E. 50HP Mtr.

Beardsley & Piper #60 Sand Preparator—Ser. 215-5406 installed in 1955

Beardsley & Piper—Motive Jr. Installed 1950—1st. Arm—12′ Ramming Unit 4′, 19″ Head W/4″ Tip—2 Speed 13/20 HP 1200/1800 RPM. Arm. Mtr. 2 HP-950 RPM C/W Magnetic Separator—Rectifier Elevator & (2) 200 cu. ft. Crane Type Hoppers, 300′ Cable Reel.

Beardsley & Piper Mulbaro's 3½ cu. ft. (1)—W/6 Extra Barrels

American Wheelabrator — 72″ Swing Table installed 1952—Exc. Condition W/Dust Collector

1—American Wheelabrator Dust Collector KD-45

Hyster Karry Krane 10,000 lbs. Cap. Lift Speed 35′ F.P.M.

1—Towmotor—Ser. 680 P 60005—1960—Spec. #332 Model 680 DLP Lift 120″—Cap. 8000# at 24″ Load Center, 48″ Forks, Propane Fuel.

Hough Payloader Model—HA—Ser. 26712—Pneumatic Tire

Clam Shell C. H. Williams Eng. H.O. Single Action

American-Model "F" Core Rod Straightener ⅜″ x 1¼″—Shears ¾″ Forms ⅝″ Gaggers (New Never-Used).

Fox Grinder 220/440 60cy. 10 H.P. Wheel size-24″ Dia., 3″ Wide, 12″ arbor.

Cupola Charging Unit—6000# Yale Extended arm Cupola Charge Hoist, single Beam type 26′ W/power Trolley, W/Swivel rail to charge 2 cupolas, 35′ tower.

Magnet—52″ Diameter Cutler Hammer

Miscellaneous

Core Rod, 10,000 lbs. Pneumatic Hoist, core Plates, Flask, Molding Machines, Ladle (6), Lockers, (like new) Electric Hoist, Screenarator (Model S) Foxboro air Wt. Control, Positive Blower 24 & 33 cu. ft. displacement, Rodcutter, Chippers, rammers, drop Balls, 100 ton sand storage.

RIVERSIDE IRON WORKS
10640 So. Buffalo
Chicago 17, Illinois
Telephone—374-1322

For More Information Circle 866, Page 87

• FOR SALE

C. GREENE EQUIPMENT CORP.

GOOD USED FOUNDRY EQUIPMENT

SPO Jolt, Squeeze Pin Lift, model 2138C
SPO Model 9546 Jolt, squeeze, rollover draw
Simpson No. 1½ UD Muller
Simpson No. 3 Enclosed gear Muller
Simpson No. 1 Open gear Muller
Osborn squeezers 276J and PJ
American AM. Tumblast 15 x 20 w/D Coll.
American Tumblast 36 x 42 w/skip
J & J Model 918 Rollover
International Model 30 x 8 Rollovers
International Model 24 x 10 Rollovers
International Jolt pin lifts all sizes
J & J Model 8128 Jolt pin Lifts Table 30 x 38
SPO Rollover pattern draw Model RD 6815 table 36 x 68 draw 15″
International plain jolt machines all sizes
International core blowers all sizes
Champion core blower Model CB 10
International hand operated pin push ups
Robbins shakeout 4 x 6 and 6 x 10
Pangborn Table cleaning machine Model LG6 with 6′ table and 24″ aux. tables complete with Dust Collector
Ingersoll-Rand 100 hp Air Compressor
Air Compressors 25 hp.
Whiting coal pulverizer Model 30 complete
Whiting coal pulverizer Model 30A complete
Dust Collectors many sizes
Fisher Aluminum Melting Furnaces 1000 lb cap.
Fisher Aluminum Melting Furnace 300 lb. cap. motorized nose pour gas fired
Bondactor Model 1000L
Tessmer sprue cutters
Hough Payloaders Model HA ½ yard
Tractomotive payloader ¾ yd. cap.
Air hoists 1000 lb. to 4000 lb.
Ladles all sizes
Steel flasks all sizes
Core ovens all sizes
Beardsley & Piper Tractor type slinger

Many More Items Available

WE SOLICIT YOUR INQUIRIES

WE BUY WE SELL WE TRADE

C. GREENE EQUIPMENT CORP.
4614 W. 24th St.
CHICAGO 23, ILLINOIS
LAFAYETTE 1-1322

FOR SALE

960 Cycle Induction Melting Furnaces—Like new! 2500 lbs. capacity—2 units. 1000 lbs capacity—1 unit.

Power supply not available.

We would consider any reasonable offer.

SABIN METAL CORPORATION
310 MESEROLE STREET BROOKLYN 6, N. Y.

FOR SALE

12 x 10 Chicago Pneumatic Compressor with 60 H.P. Motor. Capacity 300 CFM. Compressor completely overhauled. Excellent condition. Price $1,450.00 f.o.b. Alpena. Address: THUNDER BAY MFG. CORPORATION, Alpena, Michigan. Phone: ELMWOOD 4-3181.

CUPOLAS FOR SALE

1—#4 Modern Cupola purchased new in 1955—good operating condition. Overall height 61′; detachable wind box; front and rear slag spouts.

1—#8 Standard Whiting Cupola purchased new in 1949—good operating condition. Overall height 65′; built-in wind box; rear slag spout.

Purchaser to dismantle and remove at own expense. Installation and location central Illinois.

BOX 148, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOR SALE

Complete Dietert sand lab.

1—Foundry Equipment Co., 500,000 BTU mold dryer.

MEECH FOUNDRY INC.
9906 MEECH AVE. CLEVELAND 5, OHIO
PHONE: MICHIGAN 1-5550

FOUNDRY CLOSED

CORE ROOM EQUIPMENT

CARL MAYER TOWER CORE OVEN. Installed 1959—Conveyorized loading. Pneumatic unloading mechanism. Racks—(30), 30″ Wide x 90″ Long, Space D-O″ to 25″—Variable Speeds per cycle. Complete W/all Electrics.

CORE ROOM EQUIPMENT

1. Link Belt Bucket Elevator 45′ Centers—New 1960 12″ x 7″ Buckets on 18″ Centers.
2. Sand Storage Silo New 1960
3. #2 Simpson Mullers—Style UD-Skip Loader — Aerator Timer, Water meter, Dust Hood Etc.
4. Beardsley & Piper—5 Ton Plate Feeder 70″ Dia. C/W Hoppertrol & Natl. Engr. Skip Loader.
5. Beardsley & Piper Swing Slinger 19″ Head, 4″ Tip, 2 Speed 25/16 HP. Slings—7 to 10 cu. ft. per minute.
6. Mathews conveyor Loop for Hdlg. Core Boxes.
7. Hapman Dutton Core Sand Conveyor.
8. International Type AN—New 1960 Air Clamp—Rollover & Draw 24″ x 12″ Cap. 750#.

COMPLETE FOUNDRY SAND SYSTEM

(1) Simpson #2UD Muller—(2) JF9—Hewitt Robins 4′ x 6′ Shakeouts, (200) Ton Sand Storage—Bolted Construction, (3) Bucket Elevator.

MOLDING MACHINES

Osborn—#643, #242W, #243, and #442—Jolt-Rollover and Draw.

Osborn #559 HD & #559 Jolt Strippers.

Milwaukee #124 Jolt Squeeze.

OTHER EQUIPMENT

(3) Hough-HA Payloaders (25) Pneumatic Hoist—(1) Coleman DBL. Compartment Core Oven, (2) Cupolas #6 & #7 Whiting, (1) Whiting 2000# Mixing Ladle (2) Modern I.G. Ladles (1) Tincher Block Buster Welder, (3) 100 KVA-480 Transformers, (1) Climax #3 Wire Straightener, (1) Sly 36″ x 72″ Tumbling Mill, (2) Hammond Snag Grinders—10HP (100) Hines Flasks (200) Hines Jackets.

AND MANY OTHERS ITEMS!

COMPLETE FOUNDRY LABORATORY

Equipment located at:

FULLER FOUNDRY
1527 Fulford Street
Kalamazoo, Michigan
Telephone: FIRESIDE 9-1445

For More Information Circle 867, Page 87

Universal* MACHINERY AND EQUIPMENT CO.

. . . large enough to serve you, small enough to know you.

1632 North Ninth Street
Reading, Pa., Franklin 3-5103

• AIR COMPRESSORS
75 hp I.R. water cooled, horizontal
100 hp WORTHINGTON air cooled, 2 stage

• BLOWERS
CENTRIFUGAL 5 Hp to 30 Hp
GE, WILBRAHAM—GREEN FISHER Positive Pressure & Cent., Cupola Blowers

• BLAST CLEANING EQUIPMENT
15" Cont. WHEELABRATOR Tumblast
15" x 20" WHEELABRATOR Tumblast
26" Cont. WHEELABRATOR Tumblast
20" x 27" WHEELABRATOR Tumblast
27" x 36" WHEELABRATOR Tumblast
36" x 42" WHEELABRATOR Tumblast
48" x 42" WHEELABRATOR Tumblast
48" x 48" WHEELABRATOR Tumblast
48" x 72" WHEELABRATOR Tumblast
1-A WHEELABRATOR Multi-table
72" WHEELABRATOR Swing Table
WHEELABRATOR Pipe Cleaning Cabinet
PANGBORN 8' LF Table
PANGBORN Air Blast Room 8' x 8' x 11'
6' LK PANGBORN Table Room
6' LG PANGBORN Table
9' LG PANGBORN Table
DUST COLLECTORS AND SKIP LOADERS AVAILABLE FOR ALL MACHINES

• CONVEYORS
CARRIER Oscillating, 18" W x 54' L
LINK-BELT, Car type mold, 114 cars, 403' track, car sizes 18" x 42"
SIMPLICITY 24" x 10' Feeder w/hopper, Model OA-10-JA2
Roller Conveyor—Ask for List

• CORE BLOWERS
DEMMLER #1, #2, #2A, #3K
INTERNATIONAL 8B-13
MILWAUKEE TACCONE #4-M
OSBORN #91, #192, #91-10
TACONNE #4D, 10" Draw Stroke Cyl.

• DUST COLLECTORS
COMPLETE STOCK cloth, dry and wet types; 1000 to 17000 CFM

• FURNACES
DIRECT ARC MELTING
500 lb. LECTROMELT, Top Charge
1000 lb. SWINDELL, Door Charge
2000 lb. HEROULT
2000 lb. SWINDELL, 3/60 1000 KVA
1½ Ton HEROULT
7' Top Charge Furnace
8' Top Charge Furnace
11' Top Charge Furnace

INDIRECT ARC MELTING
10# DETROIT
350# DETROIT LFA
750# DETROIT LFY, Conical Shell
1000# DETROIT AA
3000# DETROIT C, 500 KVA

INDUCTION MELTING & HEATING

175 KW AJAX Induction Melting Installation
Ideal for nonferrous work. With 2 lift coils. Can add standard tilt furnaces for steel.
Send for complete details.

30 KW, ECCO Hi-freq. Vacuum Melting
30 KW, LEPEL, water cooled spark gap
35 KVA, AJAX Spark Gap, High Freq.
steel
50 KW to 200 KW TOCCO Units
100 KW AJAX Production Heat Unit

GAS & OIL FIRED
400# FISHER, MNP
1000# HAUSFELD Hand Tilt, Oil fired, alum or magnesium
1—#900 JC STROMAN, gas, Like new
6000# STROMAN, gas fired
20 Gas & Oil Fired Furnaces

HEAT TREATING
4' x 4' x 10' Gas Fired Annealing
210 KW LINDBERG conveyor box type
7' Rotary G.E. 200 K.W. 1950° F
36" x 36" West. Pit Type Electric
10" x 12" x 24" LINDBERG, 2500° F. Hyd
36 x 96, 48 x 120, 48 x 144 gas fired
Large Stock Gas Fired Box Heat Treating Furnaces

• PIT TYPE ANNEALING
42 x 96, 42 x 120 recirculating gas fired

• GRINDERS
DOUBLE END
3 Hp HISEY WOLF 3/60/220
5 Hp U.S. Model 64, 3/60/220
7½ Hp U.S. Model 66, 3/60/440
15 Hp MARSCHKE 220 volt
25 Hp KLING 3" dia. shaft

SWING FRAME
10 Hp SAFETY 24" x 3" wheel
15 Hp MARSCHKE 3/60/220-440
15 Hp MUMMERT-DIXON

• LADLES
BOTTOM POUR
MODERN, 49" x 49"
MODERN Crane Type, 55" H x 50" top
MODERN Crane Type, 60" H x 60" top

LIP POUR
WHITING 28" x 28" top dia. geared
WHITING 29" x 29" top dia. geared
WHITING 52" x 52" top dia. geared
WHITING 33" x 33" top dia. geared

CYLINDRICAL
WHITING, 26" L x 25" dia, 1100# iron
WHITING, 19" L x 22" dia, 600# iron
WHITING, 38" L x 28" dia, 2200# iron

• MATERIALS HANDLING
BYERS Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
HOUGH PAYLOADER, Model HA, 1000# cap., hyd. lift

• OVENS
ALLIS CHALMERS 20 KW, Model 750, dielectric
COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22' x 12' x 10'
GIRDLER Thermex Dielectric Core Oven, 15KW w/36" W mesh belt
THERMONIC Dielectric Core Oven, 18 KW, w/40" wide mesh belt

• PRESSES
40 Ton FERRACUTE Sprue Cutter 1½" stroke
125 ton R.D. WOOD Down acting, 9" stroke
NIAGARA No. 82 Punch Press

• SAND CONDITIONING
B&P Nite-Gang
B&P Screenarator, Model "M"
LINK-BELT Revivifier
ROYER NB-2, 7-10 tons/hr., ¾ Hp.
ROYER, NC-2, 10-15 tons/hr, 1½ Hp
ROYER PREPARATOR, Comb., Model NDC, 25 ton/hr scrap removal 8' x 8' hopper
ROYER, NDP, 15-25 tons/hr, 2 Hp
ROYER, "NRP," 40-60 tons/hr, 5 Hp.

• SAND SLINGERS
B&P Stationary, Single Speed
B&P Tractor Type 19" Head
B&P Motive Jr., 2 speed, 19" head, 5" tip

• TESTING MACHINES
3000 Kg Gogan Brinell Testers

TOCCO SALE — INDUCTION HEATING UNITS

2—50 KW TOCCO 9600 cycle, 100 Hp motor
3—50 KW TOCCO JR. 2 station, 9600 cycle, 90 Hp motor
2—80 KW TOCCO JR. 2 station, 9600 cycle, 140 Hp motor
4—100 KW TOCCO JR. 2 station, 9600 cycle, 175 Hp motor
1—200 KW TOCCO JR. 1 station, 3000 cycle, 310 Hp motor

• MOLDING MACHINES
JOLT ROLLOVER PATTERN DRAW
DAVENPORT #408A, 40" x 60" table,
HERMAN 750#, 20" x 24" table
HERMAN 10,000#, 48" x 109" table
HERMAN 6000#, 42" x 78"
HERMAN 7500#, 40" x 50" table
HERMAN 3000#, 30" x 66" table
HERMAN 3000#, 32" x 70", 15" cyl. series charging conveyor type
HERMAN 1500#, 30" x 48" table
INTERNATIONAL 27" x 16", Type F, 22" x 64" table
INTERNATIONAL 31" x 16", Type F, 28" x 78" table
INTERNATIONAL 30" x 12", Type G, 24" x 35" table
INTERNATIONAL 13" x 17" table
INTERNATIONAL 43" x 16", type F, 42" x 72" table
J & J #610, 24" x 30" table
OSBORN #243 31" x 42"
OSBORN #602, 36" x 26", 900#
OSBORN #405, 3000#, flask 64" x 57"
TABOR 22" x 42" pattern draw shockless, portable 600#
TABOR 20" x 30" w/air clamp 1000#
TABOR 14" x 16" Rockover 150#
TABOR 40" x 50" table, 3000# capacity

PLAIN JOLT
INTERNATIONAL, 3' x 4' Table, 12" cyl.
TABOR 3' x 4' table

JOLT PIN LIFT
HERMAN #1317, 22" x 30" table
OSBORN #558, 21" x 24" table
OSBORN #540, 29" x 38" table
SPO #3058, 23" x 27" table
SPO #305, 750 lb. 20" x 27" table
TABOR 20" x 24" table, 600#

JOLT SQUEEZE PIN LIFT
INTERNATIONAL PKL, 20" x 28" table, 14" sq. 5½" draw
INTERNATIONAL PKL, 15" x 24" table, 12" sq., 5½" draw, stat.
MILWAUKEE #163, 15" x 24" table, 11" sq., 1500#
NICHOLLS 18-44, 6¼" draw
OSBORN, #712J, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
OSBORN #716 PJ, 22" x 34" table 16" sq., 8" draw
OSBORN #1024, 1800#, 10¼" draw
SPO #2114P, 21" x 27" table, 600#
SPO, #2116, 21" x 27" table, 11" sq.

JOLT SQUEEZERS
INTERNATIONAL #12 LJS, 16" x 20"
OSBORN #276-J & PJ, 17" x 26" table
OSBORN #275J, 16" x 20" table, 400#
SPO #110J, 17" x 20" table, 400#
SPO 113PJ, 18½" x 26" table
TABOR Squeeze-in Head, 16" x 19" table
TABOR Yoke Type, 18" x 26" table

• MULLERS AND MIXERS
B&P No. 3½ Mulbaro, 3½ cu. ft.
B&P #30 Speedmuller w/skip, 3 cu. ft.
B&P #40 Speedmuller w/skip, 5 cu. ft
B&P Conventional, SIMPSON type, 87½" Dia., arranged for cooling
B & P #70 Speedmuller, 15 cu. ft. w/cooling.
CLEARFIELD #920, 9' dia., 30 cu. ft.
CLEARFIELD #610, 6' dia., 14 cu. ft.
SIMPSON, #0, U.D., 3' Dia.
SIMPSON #1, U.D., 4' dia., 4 cu. ft.
SIMPSON #1, Sep. Dr., 4' dia., 4 cu. ft.
SIMPSON #1½, Sep. Dr., 4'6" dia., 6 cu. ft.
SIMPSON #2, U.D., 6' dia., 14 cu. ft.
SIMPSON #3, 8' Dia. Sep. Dr. or U.D. 30 cu. ft.
WHIRLMIX, 31" dia., 200 to 300 lb. sand

• SHAKEOUTS
2' x 10' HEWITT-ROBINS
3' x 10' SIMPLICITY
4' x 5' SIMPLICITY
4' x 6' SIMPLICITY
4' x 8' SIMPLICITY
5' x 6' HEWITT-ROBINS

• TRANSFORMERS (Furnace)
100 KVA KUHLMAN 13,200, 1/60
250 KVA WESTINGHOUSE 6600, 3/60
300 KVA WAGNER 4600, 1/60
500 KVA KUHLMAN 13,200, 1/60
800 KVA PENNA, 23,000, 3/60
1000 KVA WESTINGHOUSE 23,000, 3/60
1000 KVA G.E. 13,200, 3/60
2000 KVA WESTINGHOUSE 13,200, 3/60
5000 KVA WESTINGHOUSE 2300, 3/60
7500 KVA PENNA, 13,200, 3/60

• MISCELLANEOUS
AMERICAN "F" Rod Straightener, ⅜" to 1¼"
BLASTCRETE Model PM-1 Cupola Gun
FLASKS, CORE PLATES, All Sizes
CLIMAX Model 2-A Wire Straightener
CRESCENT Band Saw, 32" wheels
45" Magnet 230V. D. C.
SLY Rd. Tumb. Barrels 68" x 32", 48" x 36"
MOULDER'S Hoppers, Various Sizes
TABOR 10 HP Cut-off Saw

* Your *DEPENDABLE* Foundry Equipment Dealer

For More Information Circle 872, Page 87

THE ACME bargain page

BLOWERS
I.-R. 12900 cfm, 100 h.p. 220-440 V. 20 oz.
GE 10500 cfm., 20 oz., 85 h.p., 220 V.
GE 7500 cfm., 20 oz., 89.6 h.p., 220-440 V.
SPENCER 7350 cfm., 16 oz., 50 h.p.
GE Centrifugal 6200 cfm., 24 oz., 58 h.p.
6000 cfm. INGERSOLL-RAND 32 oz.
SPENCER 3500 cfm., 20 oz., 40 h.p.
SPENCER 2250 cfm., 16 oz., 15 h.p., 220
SPENCER 1350 cfm., 32 oz.
NORTH AMERICAN 1050 cfm., 16 oz.
NORTH AMERICAN 850 cfm.
500 cfm NORTH AMERICAN 12 oz.
McKee 200 cfm
2—SPENCER Turbo 50 hp 4800 cfm 24 oz.
2—SPENCER Turbo 50 hp 3600 cfm 24 oz.

CLEANING EQUIPMENT
27" x 36" American w/skip
48" x 48" AMERICAN w/skip
6' Table PANGBORN
AMERICAN #2 Tablast 8-28" tables, late
PANGBORN GD1-Airblast Barrel
88" PANGBORN double swingout table
SLY #4 Blast Mills

CONVEYORS
17' BARBER GREEN Bucket Conveyor
1500'—458 Chain w/drive, will sell all or part
24" x 13'-9" Magnet Belt

CONVEYORS, OSCILLATING
24" x 40' Ajax
SIMPLICITY 18" x 24'
SYNTRON 24" x 6'
AJAX 12" x 20'6"
36" x 11' Ajax
8" x 13' Ajax
3' x 10' SIMPLICITY OA-10A

CORE BLOWERS
CB15 55# cores, Universal blow plate
CB5-4# cores
DEMMLER #50
1—DEMMLER #55 w/vibratory hopper
2—DEMMLER #55 w/plain hopper
DEMMLER 2EO
DEMMLER 2K
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL SB 15H, up to 150# cores. Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
6—OSBORN 193 up to 50# cores
REDFORD Bench #2 & #4

CORE GRINDERS
1—MILWAUKEE 70-9

CORE OVENS
THERMONIC INDUCTION MODEL 1800A
2—Despatch ET, Draw Type

CORE ROLLOVERS
2—INTERNATIONAL GR hand ram power rollover 22" x 24" x 10" draw
INTERNATIONAL REDP Rollover 12" draw
SUTTER #500

CRANES
2—WHITING 10 Ton cap. 107'3½" span, OETC Outdoor type
1—WHITING 3 Ton OETC Cupola Charge Crane, 20' span

CUPOLA GUNS
1—Bondactor #1250 and 1000

CUTOFF SAWS
UNUSED DEWALT CUTOFF SAWS for ferrous or nonferrous metals cutoff or as sprue cutters. Flush blade adapter takes up to 20" abrasive blade or saw. Power Hoist to arm. Chain & Sprocket cross feed for working on heavy cast iron 48" x 60" "T" slot table or off table cutting or large work. Motor swivels horizontal to vertical in yoke.

DUST COLLECTORS
ROTOCLONE 8D 2000 cfm 5 hp
SLY #11—590 cfm
ROTOCLONE 8B 2000 cfm w/after cleaner

ELECTRIC MELTING FURNACES
1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# and 350# Tapered Shell 2300 V.

FURNACES
400# Fisher Motorized Tilt, Gas Fired
600# Fisher Stationary
600# Campbell Hausfeld Brass

GRINDERS, MISC.
U.S. #70 Comb. 20" disc & 20"x3"x1½" wh
53" Hanchett Horizontal Disc
GARDNER 36" Vert Disc
BRADFORD Metalmaster 18" Disc
STANDARD 24" disc & snag

GRINDERS, SNAG
US #64 D.E. 20" x 3" x 10"
#5 Fox Sgl. Wh. 24" snag.
2—KLING type RT H.D. 24" x 3" x 12" D.E.
KLING H.D. 20" x 2" x 7" D.E.
5—#6 FOX Single Wheel 24" Snag
STANDARD 20" x 3" 7½ h.p.
STANDARD 30 h.p. Type 50—30" x 5"

GRINDERS, SWING FRAME
FOX 24" x 3" x 12", 15 h.p.
MARSCHKE 24" x 3" x 12" 20 h.p., 220 V.
U. S. 24" x 3" x 12" 15 h.p., 220-440 V.
2—MARSCHKE 3 h.p., 12" wheel

HEAT TREATING FURNACES
G. E. Elevator Type 1950° Atmosphere Generator 65" x 16' car. Electric. Late
G. E. Elevator type 2150°—96" x 144" car atmosphere generator. Electric. Late
3—ABBOTT 24" H x 22" Deep x 30" Wide, Gas Fired
HOLDEN #202 1850° Bright Hardening Annealing
HOSKINS 40 KW—1850°
25 KW Westinghouse 2000°

HOISTS
6000# Cleveland w/monotractor travel
6000# Electrolift
15—INGERSOLL-RAND 500# to 6000#
4—2000# R & M
1—500# Ingersoll-Rand LC-4

INDUCTION MELTING EQUIPMENT
30 KW Lepel Spark Gap

LADLES and POURING DEVICES
WHITING 16000# Crane
Whiting 5000# Crane
4000# Industrial Holding
WHITING 28 x 28—2300# Iron
MODERN 1000#—Geared Covered Crane
9—MODERN FA9 Pouring Devices 2000# cap.
6000# WHITING enclosed gear

MOLD BLOWER
TACONNE TD4 24" x 32" flask

MOLD CONVEYOR
366'—51—44" x 66" cars

MOLDING MACHINES
JOLT SQUEEZE PIN LIFT
6—MILWAUKEE 2646 Jolt Squeeze Strip rolloff—rolling molding machines 10" jolt cylinder; 1500# capacity, 26" Squeeze cylinder; 13" draw. Flask size 25½" to 29" wide, 52" long. FACTORY REBUILT.
MILWAUKEE No. 145-2, 27" x 30" table
8—OSBORN 712 PJ 18" x 28" table
1—CHAMPION JSL10P 18" x 21" table 6" draw

JOLT SQUEEZERS
MILWAUKEE 181-7, 24" x 36" table
MILWAUKEE #162—1, 900 lbs. cap.
2—113 PJ SPO
OSBORN 275PJ
25—124 MILWAUKEE Portable Jolt Sq.
6—104 MILWAUKEE Portable Jolt Sq.
8—MILWAUKEE 103-5 17" x 26" table

JOLT ROLLOVER DRAWS
2—918 J & J 2000# cap. 20" draw
643 OSBORN 2000# cap. 20" draw
40" TABOR 2000# cap. 15" draw
30" TABOR 1000# cap. 12" draw
SPO 506
34A DAVENPORT
DAVENPORT 24SA 900# 24" x 28" table
HERMAN 3000#
2—750# HERMAN 20" x 30" table
INTERNATIONAL RJ 20" x 12"

JOLT SQUEEZE ROLLOVER DRAW
OSBORN 331-332-333
SPO 413D
INTERNATIONAL RES

PLAIN JOLT
36" x 60" Herman

JOLT PIN LIFTS
1536 MILWAUKEE 1500# cap. 12" draw
1030 MILWAUKEE

MULLERS and MIXERS
1½ SIMPSON U.D. Model 700#
1—#3 UD Simpson
3—#2 Simpson UD
#40 B & P w/skip and water meter
#60 B & P Rebuilt w/spare parts, mtr. & starter
CLEARFIELD #404
1—#2 SIMPSON OG
CLEARFIELD #610

ROLLOVERS
HERMAN 46" x 112" charge conveyor rollover 56" draw, late

SAND CONDITIONERS
AMERICAN 51"
ROYER NDC—ND2
SCREENARATORS S-M-L

SAND SLINGERS & EQUIPMENT
3—19"—2 speed Stationary
2—14' Turntables
4—7' Plate Feeders, 35 & 45 Tons
B & P 44-44 Speed Draw 12" draw

SAND SYSTEM EQUIPMENT
33' Newaygo Bucket Elevator 12" x 7"
28' Newaygo Bucket Elevator 12" x 7"
4—7' B&P Plate Feeders, 35 & 45 Tons
2—18" x 52' Magnetic Belt
4' x 8' SIMPLICITY ring crusher screen

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic

SCALES
FAIRBANKS charge scale 11250# cap.

SHAKEOUTS
6' x 10' SIMPLICITY, Som—11, Spring Mounted

4 x 8 LINK-BELT
2' x 8' Double Deck
4 x 6 LINK-BELT
6 x 10 HEWITT-ROBINS

SHELL EQUIPMENT
SHELL PROCESS 20" x 36" pattern size w/shell blender and bonding press

SPRUE CUTTERS
1—MILWAUKEE #85 TON
OBERMAYER 2 H.P.

STRAIGHTENING PRESS HYDRAULIC
225 ton Southwark
150 ton Farquhar "C" Frame
60 ton Lempco 4 post
25 ton Fox
25 ton Dennison

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous
COLEMAN 55 Spectrophotometer
GOGAN Model 1414-2V
120,000# YOUNG Tensile Tester

TUMBLING BARRELS
ROTO-FINISH Model DW 45-36
SLY, 24" x 48"; 3 H.P.
SLY, 30" x 60" Duplex

WOODWORKING—PATTERNSHOP
OLIVER #290 Dbl Arbor, Tilto-Arbor Saw
1—OLIVER 182D, 15" Disc Sander
CRESCENT 24" planer
6", 8", 12", 20" and 30" Jointers
24" x 36" Band Saws

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MONA

PARTIAL LISTING OF EQUIPMENT NOW AVAILABLE — INQUIRIES INVITED

SAND MULLERS

CLEARFIELD

MODEL	PAN. DIA.	CAPACITY
404	4′	400#
610	6′	1500#

BEARDSLEY & PIPER

MODEL	CAPACITY	AIR COOLED
30	4 cu. ft.	Yes
30	4 cu. ft.	No
60	12 cu. ft.	Yes
60	12 cu. ft.	No
70	15 cu. ft.	No
80	20 cu. ft.	Yes

ALL CAN BE EQUIPPED WITH DUST HOODS, SKIP HOIST LOADERS, MULTRAMATIC CONTROLS, ETC.

SIMPSON

MODEL	PAN. DIA.	CAPACITY	DRIVE
1½	4′–6″	700#	UD
2	6′	1500#	Encld.
3	8′	3000#	UD
3	8′	3000#	Encld.
3½	9′–3″	5000#	UD

ALL CAN BE EQUIPPED WITH NATL. ENG. STRAIGHT LIFT SKIP HOIST BUCKET LOADERS.

LANCASTER

MODEL	PAN. DIA.	CAPACITY
EA4	59″	9 cu. ft.
EBG-4	59″	9 cu. ft.

OSCILLATING CONVEYORS

AJAX ENGINEERING (Lo-Veyor)

MODEL	SIZE	CAPACITY in T P H
LC 24-6-7	24″ W x 7′ L	70
LC 36-6-9DA	36″ W x 9′ L	100
LC 36-6-14 DA	36″ W x 14′ L	100
SIMPLICITY ENGINEERING		
OA-10-JA	24″ W x 13′ L	150
OA-10-JA	24″ W x 11′ L	150
OA-10-JA-2	30″ W x 7′ L	150
OA-10-JA	30″ W x 13′ L	100
OA-10-A	36″ W x 10′ L	200
OA-10-A	36″ W x 16′ L	200
OA-10-A	36″ W x 25′ L	600

SANDSLINGERS

B&P Stationary, Model "DB," 5′ jib arm, 4′ ram, 19″ head, 5″ cup, 2-speed, 20/13 HP. Raising & lowering arms or fixed.
B&P Stationary, Model "DB," 8′ jib arm, 4′ ram, 19″ head, 4″ tip, 20/16 HP. Raising & lowering arms or fixed.
B&P "Motive Jr.," 11′ jib arm, 4′ ram, 16″ head, 4″ cup, R & L arms, 2-speed, 20/13 HP.
B&P "Motive," 15′ jib arm, 9′ ram, 2-speed, 25/16 HP. With Raising & Lowering.

HANDY SANDYS

NEWAYGO SH8-4-G Super Handy Sandys, Single Hopper, 15 cu. ft. capacity, 4′ receiving hopper, 21′ elevator.
NEWAYGO SH84-GT Super Handy Sandy, Twin Hoppers, 25 cu. ft. capacity, 4′ receiving hopper, 21′ elevator.
NATIONAL ENGINEERING Moulders Helper. Twin Hopper, 3000# capacity, each air operated gates. Model B.

CUPOLA BLOWERS

INGERSOLL RAND

MODEL	C F M	PRESSURE	HP
FS-337	3000	20 oz.	25
FS-365	4500	16 oz.	30
FS-355	6000	16 oz.	40
FS-387	10,200	20 oz.	75
FS-377	10,500	20 oz.	85
FS-565	14,100	40 oz.	200
ROOTS CONNERSVILLE			
RCR	1040	20 oz.	10
RCS	9075	32 oz.	100

RAREST OPPORTUNITIES! LATEST DESIGN & METHOD! NOW AVAILABLE!

These listed below are exceptional purchases we have been fortunate in making during the last 30 days. Equipment of this caliber has never been offered on the Used Market. Savings of 40 to 60%. Machinery a few years old.

DIELECTRIC CORE OVEN

1—COLEMAN Model CD-75 Dielectric Core Oven 10′ Wide 40′ Long x 7′ High—Mesh Belt Conveyor Type. Belt width 5′—Work area 64″ Width x 19″ High opening. Power required 165 KVA. 3 Phase, 60 Cycle, 460 Volts. Unit new in 1957 and used less than 3 years. Acquisition cost over $44,000.00—In Like New Condition—Save more than 50%.

TUMBLAST

1—AMERICAN 48″ x 72″ Tumblast, 30 Cu. Ft. load cap. Complete w/skip hoist loader and all electrical. Serial #A99334. New 1956—Used very little.

SAND MULLERS

1—B&P #70 Speedmullor. 18 Cu. Ft. Batch Cap. Air Cooled, w/Skip hoist loader. New 1951.
1—CLEARFIELD #920 Sand Muller, 9′ pan dia., 3000# batch cap.

INDUCTION MELTING FURNACES

2—AJAX 20 KW Induction Melting Furnaces, Convertor type, 3000 cycle, w/two 20# furnaces.
5—AJAX 150 KW Induction Melting Furnaces, 440 V, 60 cycles. 1000 to 1200# brass cap.
6—AJAX Model CS-1 35 KW Induction Melting & Holding Furnaces. 800# holding cap., 175# melting cap.
4—TOCCO 15 KW, 10,000 cycle Melting Units, 15# furnace. Will melt 12# of steel in 19 minutes.
1—AJAX 333 KVA, 960 cycle Induction Melting Installation. Complete with all controls, capacitors, etc. Will melt 1000# in 60 min. at 2900° F. With 2000# cap. furnace.
1—10# HORACE DREVER Indirect Arc Melting Furnace, 3000° F. Complete with all controls and transformers.

ELECTRIC DUPLEXING FURNACE

1—WHITING 10 ton Hydro-Arc Furnace for Duplexing Malleable Iron from cupola, 10′ dia. shell, motorized tilt 9″ dia. electrodes, cap. 18 to 23 ton per hour, w/Allis-Chalmers 2000 KVA transformer, 12,000 volt-motorized tap changer. Unit new 1953.

SPECIAL!

EXCEPTIONAL PURCHASE • INGERSOLL-RAND AIR HOISTS FROM LEADING GOV'T. INSTALLATION • SAVE MORE THAN 50%

QUAN.	MODEL NO.	CAP.	PRICE
6	A	500#	259.50
5	B	1000#	279.50
17	C	2000#	439.50
21	D	4000#	539.50
13	D-6	6000#	739.50
7	E	10,000#	939.50

All equipped with top hooks for hanging; A-430 Trollies and Air Trollies, Extra. Discounts if purchased in quantity.

JOLT ROLLOVER PATTERN DRAW

DAVENPORT

MODEL	TABLE SIZE	DRAW	CAP.
24 SA	24″ x 38″	12″	1000#
28 SA	28″ x 40″	12″	1500#
34 A	34″ x 58″	15″	2500#
48 A	48″ x 82″	24″	6000#
INTERNATIONAL			
AN	40″ x open	20″	4500#
JOHNSTON & JENNINGS			
612	24″ x 30″	12″	600#
815	30″ x 40″	15″	1200#
918	44″ x 54″	20″	2000#
920-RC	44″ x 54″	20″	2000#
1020-RC	50″ x 60″	20″	3000#
OSBORN			
242-W	29″ x 42″	12″ to 19″	1500#
244	35″ x 52″	16″ to 25″	3000#
405	57″ x 64″	26″	3000#
442	21″ x 31″	10″	600#
601	24″ x 30″	10″	900#
602	30″ x 36″	12″	1200#
643	35″ x 50″	20″	2000#
SPO			
505	18″ x 23″	6½″	400#
506	24″ x 25″	10″	600#
TABOR			
MODEL	TABLE SIZE	DRAW	CAP.
22″	22″ x 32″	10″	600#
22″	22″ x 42″	10″	600#
30″	30″ x 40″	12″	1000#

JOLT PIN LIFT MACHINES

DAVENPORT

MODEL	TABLE SIZE	DRAW	CAP.
34 A-JS	36″ x 46″	12″	2500#
INTERNATIONAL			
JDP 1200x8	24″ x 26″	8″	1200#
JDP 3000x10	48″ x 48″	10″	3000#
JL	32″ x 52″	12″	2000#
JOHNSTON & JENNINGS			
68-SP	25″ x 30″	8″	600#
MILWAUKEE			
1030	28″ x 34″	8″	1000#
1536	32″ x 38″	10″	1500#
2036	32″ x 38″	10″	2000#
2542	38″ x 42″	12″	3000#
3548-6	44″ x 46″	12″	3500#
OSBORN			
540	32″ x 52″	12″	2000#
560	32″ x 45″	12″	2500#
SPO			
3070	26″ x 35″	10″	1500#

JOLT SQUEEZERS

MILWAUKEE

MODEL	TABLE SIZE	SQ. CYL.
104	18″ x 15″	10″
123	17″ x 26″	12″
141	20½″ x 30″	14″
181	24″ x 36″	18″
OSBORN		
275-J	16″ x 20″	10″
276-J	17″ x 26″	13″
SPO		
110-J	17″ x 20″	10″
113-P	18½″ x 26″	13″

JOLT SQUEEZE PIN LIFT MACHINES

MODEL	TABLE SIZE	DRAW	DIA.	CAP.
PKL-12	18″ x 24″	5½″	12″	600#
PKL-14	20″ x 28″	5½″	14″	1000#
PK-16	20″ x 30″	8″	16″	1700#
MILWAUKEE				
125	21″ x 27″	8″	12″	1200#
145	24″ x 30″	8″	14″	1700#
195	28″ x 39″	10″	19″	3000#
196	16¾″ x 39″	10″	19″	3000#
214	20″ x 32″	10″	21″	2500#
244	22″ x 32″	12″	24″	3000#
245	35¼″ x 42″	12″	24″	5900#
246	23¼″ x 42″	12″	24″	5900#
OSBORN				
710-PJ	16″ x 25″	6″	10″	500#
712-PJ	18″ x 28″	6″	12″	750#
714-PJ	20″ x 31″	7″	14″	1000#
716-PJ	22″ x 34″	7″	16″	1250#
SPO				
2114-P	20″ x 27″	4″	11″	600#
2136	21″ x 30″	6″	13″	800#
2146	23″ x 31″	6″	14″	1000#

JOLT SQUEEZE ROLLOVER DRAW

MODEL	TABLE SIZE	DRAW	CYL.	CAP.
MILWAUKEE				
167	32″ x 33″	12″	16″	1000#
217	35″ x 41″	12″	21″	1200#
OSBORN				
332	26″ x 36″	9″	16″	750#
333	32″ x 45″	11″	19″	1400#
SPO				
413-C	24″ x 25″	10″	13″	600#
917-A	26″ x 36″	9″	17″	750#
9546	26″ x 32″	12″	16″	1000#

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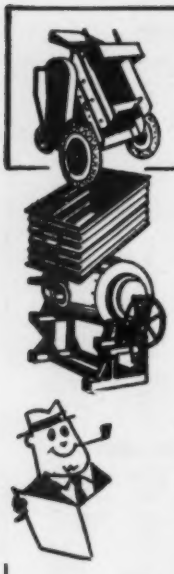

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14919 SARANAC ROAD — CLEVELAND 10, OHIO

AIR HOISTS

5—300 lbs. I-R "Air-Block" Type LC3
4—500 lbs. I-R Air hoists Model A
4—1000 lbs. I-R Air hoists Model B
1—4000 lbs. I-R Air hoists Model D
1—6000 lbs. I-R Air hoist Model D-6
2—5 ton I-R Air hoists Model E
1—8 ton Detroit Air hoist
6—Curtis Pendant Class G 1 to 3 ton
12—Hanna Pendant 100 lbs. to 1000 lbs.

HOISTS ELECTRIC

1—1 ton Cleveland Tramrail 220/3/60
1—1 ton Chisholm-Moore 220/3/60
1—2 ton Yale 230 V. D.C.

ROLLER CONVEYOR

1500 ft. 16", 18", 24", 30", 36"

FURNACES (oil & gas fired)

Hausfeld, Fisher, Monarch
#100 to #3000 Stationary & tilting

ELECTRIC FURNACES

1—500# Lectromelt, 225 KVA, 2200 to 191 volts
1—1 ton Heroult, 800 KVA, 4300 to 300-225-178 volts

HEAT TREAT FURNACES

1—Lindberg Type 3854 EHV, 107 KW
1—Lindberg Type 6060 EH, 90 KW
1—Lindberg Car Type 72" x 84" x 96" 105 KW

CORE OVENS

1—Thermonic Dielectric Model M800A, 30 KW
1—Coleman Tower 40' high, gas fired
1—Porbeck 8 drawers, oil fired

SHAKEOUTS

1—Hewitt-Robins 12' x 10' 60,000 lbs. cap.
1—Hewitt-Robins 12' x 20' 68 tons cap.

SANDSLINGERS

1—B-P Stationary Riddle Type 19" head, 4" tip
1—B-P Stationary double belt 19" head, 4" tip

SAND MULLERS

Simpson
1—#0, Type "C" 1¾ cuft.
2—#1, Unit drive 4 cuft.
1—#1½, Unit drive 6 cuft.
2—#2 Type "E" 14 cuft.
2—#3 Unit drive 30 cuft.

Clearfield
2—#610, 14 cuft.
1—#930, 30 cuft.

Beardsley-Piper
2—3½S Mulbaros
1—#50, 14½ to 29 tons per hr.

GRINDING EQUIPMENT

5 to 10 H.P. double end
30" to 53" Horizontal Gardner, Besley
7½ to 15 H.P. Swing Grinders, U. S., Mummert Dixon

SAND CONDITIONERS

B&P Screenarators Model S and M
2—Jeffrey Pugmills
1—American Type AA Sand cutter

CORE BLOWERS

Champion, Demmler, International, Osborn, Sand Blo, Redford Taccone, 2 lbs. to 100 lbs. capacity

CUPOLA BLOWERS

Ingersoll-Rand, Roots, Spencer
15 to 75 H.P.

LADLES

3—4 to 6 tons bottom pour Whiting
3—3 ton T-pot
1—1½ ton T-pot
Lip pour ½ to 25 tons

BLAST CLEANING EQUIPMENT

1—27 x 36 Wheelabrator Tumblast
1—42 x 48 Wheelabrator Tumblast
1—48 x 48 Wheelabrator Tumblast
2—26" Wheelabrator Continuous
2—72" Wheelabrator Swingout tables
2—6' tables with aux. tables
1—6' Pangborn table, air induction
2—EN2 Pangborn Cabinets

DUST COLLECTORS

American, Sly, Rotoclone, Northern 600 to 4000 CFM

HANDY SANDYS and REDDY SANDY

single and double hopper type

HINES POPOFF ALUMINUM FLASKS AND JACKETS

large inventory of various sizes

MOLDING MACHINES

Automatic
2—Taccone's Model TDA-4, 24" x 24"

JOLT ROLLOVER & DRAW

Davenport
1—Model 40A, 3500# cap. 24" draw, 40" x 66" table
2—Model SA28, 1500# cap. 12" draw, 30" x 40" table

Herman
1—6000# cap., 40" x 72" table, 40" x 60" bumper
1—750# cap. floor type, 20" x 42" table

International
2—Type "G" 600# cap. 8" draw
2—Type "G" 1000# cap. 10" draw

Johnston & Jennings
2—Model 815, 1200# cap. 15" draw, 30" x 40" table
2—Model 918, 2000# cap. 18" draw, 44" x 54" table

Osborn
4—Model 601 Portable, 10" draw, 24" x 30" flask
2—Model 602 Portable, 11" draw, 26" x 36" flask
2—Model 442 Portable, 10" draw, 600 lbs. cap.
2—Model 444 Portable, 10" draw, 1000 lbs. cap.
2—Model 242 Stationary 12" to 19" draw, 1000 lbs. cap.
1—Model 243 Stationary 12" to 21" draw, 1500 lbs. cap.
1—Model 643 Stationary 17" to 21" draw, 2000 lbs. cap.
4—Model 405 Stationary 18" draw, 3500 lbs. cap.
8—Model 2047-4 Stationary 8" draw

Spo
1—Model 505, 400# cap., 6½" draw, 18" x 23" table
1—Model 508, 1200# cap., 12" draw, 28" x 30" table

Tabor
1—30" x 40" table, 12" draw, 1000# cap.
1—22" x 32" table, 10" draw, 600# cap.

JOLT, ROLLOVER, SQUEEZE, DRAW

Osborn
1—Model 431-4, draw 7", 600# cap.
1—Model 333, draw 9", 750# cap.

Spo
1—Model 917, draw 9", 750# cap.

JOLT, SQUEEZE, PIN LIFT

International
1—LJSK, 12" squeeze cyl., 6" draw
3—PKL, 12" squeeze cyl., 8" draw

Osborn
6—710 PJ, 10" Squeeze cyl., 6" draw
6—712PJ, 12" Squeeze cyl., 6" draw
4—716PJ, 16" Squeeze cyl., 7" draw
1—720U, 11" Squeeze cyl., 4" draw

Spo
2—2114G, 11" Squeeze cyl., 4" draw
2—2136, 13" Squeeze cyl., 8" draw

Milwaukee
2—125-3, 12" Squeeze cyl., 8" draw

Davenport
1—Model 34AJS, 2500# cap., 12" draw

Herman
1—20" x 36" table, 1500 lbs. cap.
2—36" x 42" table, 4000 lbs. cap.

Johnston & Jennings
1—12168, 3000 lbs. cap., 16" draw

Osborn
1—561, 40" x 50" table, 12" draw, 5000# cap.
1—560, 32" x 45" table, 12" draw, 2500# cap.
1—540, 29" x 38" table, 12" draw, 2000# cap.
1—558, 20" x 24" table, 4" draw, 550# cap.

Spo
2—3070, 26" x 35" table, 10" draw
1—3058, 23" x 27" table, 8" draw

PLAIN JOLT

Davenport
2—Model AJ-10, 30" x 48" table, 3000# cap.

Osborn
1—Model 103, 54" x 66" table, 6400# cap.

PUSH-OFF JOLT

Champion
4—AL 2424, 8" lift, 2000# cap.
1—AL 3036, 6" lift, 3500# cap.

International
1—LP-6, 8" lift, 1000# cap.

Cope Rollover Molding Machines
International, Osborn, Tabor

Jolt Squeeze Molding Machines
Stationary and Portable, 10", 12", 13", 16" squeeze cyl.

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FOUNDRY ENGINEERING SERVICE

FOUNDRY EQUIPMENT BY FOUNDRYMEN

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SANDSLINGERS

B & P Tractor type, 6' jib, 4' ram arm, 18" head
B & P Stationary Type 6' Jib, 4' Ram Arm, 18" head, 25 HP

MECHANIZED MOLDING SYSTEM

Jeffrey 16 station Overhead Sand System, includes sand storage, muller, mold conveyor, shakeout and sand return.

JOLT SQUEEZERS

Osborn 275J
Osborn 276, 13" Portable and Stationary
International LJS 10"—12"
International PJS 16"
Tabor Top Squeeze 10"
SPO 110J—113J
Champion 10"
Milwaukee 104-5—10"—12"
SPO 2136

JOLT SQUEEZE PIN LIFT

Milwaukee 126 Portable 21 x 27 Table 8" Draw
Milwaukee 145 24 x 30 Table 8" Draw
Milwaukee 195, 28 x 39 table, 10" draw
Osborn 712 18 x 28 Table 6" Draw

International PK18 18" Sq. Cyl 8" Draw 24 x 36 Table

JOLT ROLLOVER DRAW

International "G" 30 x 12
International "F" 45 x 72 x 16" Draw
J&J 612, 25 x 30 x 8" Draw
J&J 815, 30 x 40 x15" Draw
J&J 918, 44 x 54 table, 18" Draw
J&J 10208, 50 x 60 table, 20" draw
Osborn 406 39 x 63 table
SPO 508, 28 x 30 x 9" Draw
Tabor 30 x 50 x 12" Draw Shockless

JOLT PIN LIFT

Davenport 34A, 36 x 46 x 12" Draw
J&J 12168, 36 x 54 x 16" Draw
J&J 688, 24 x 30 x 6" Draw
Milwaukee 1536, 32 x 38 x 10" Draw
Osborn 558 20" x 24" x 5" Draw
SPO 3070

JOLT SQUEEZE ROLLOVER DRAW

SPO 9546, 30 x 40 Flask 11" Draw
SPO 920, 32 x 44 Flask 11" Draw
Osborn 332, 26 x 36 Flask 9" Draw

PLAIN JOLTERS

J&J 72 x 72
Tabor 48" x 60"

SAND MULLERS

Two B&P No. 30 Shell Sand Mullers with Skip Hoists and Dust Hoods, Simpson 24" Lab Muller with Heaters, Cycle Timers for Shell Sand.

Simpson Lab Muller, 24"
Simpson Portamuller
Simpson 1½ UD w/or w/o skip hoist
Simpson No. 1, Style "H"
Simpson #2 w/skip (open gear)
Simpson #2 UD w/aerator and skip hoist
Simpson #3 UD auto-cycle, dust hood, etc.
B&P No. 3½ Mulbaro
B&P No. 30 with skip hoist
B&P #60, w or w/o Multromatic
Clearfield 610
B&P 50 with skip hoist, cooling and water meter
Simpson No. 3, Style C, enclosed gear with skip hoist.

SAND CONDITIONERS

B&P Screenerators, M. L.
B&P Junior Night Gang
National Engineering screening and magnetic separation unit
50" Molders Friend
Royer NDP, Royer NC2, Royer JR
Royer NC4
American Sand Cutter, various sizes
B&P No. 60 Preparator
3 Newaygo Handy Sandys HS7GT
1 Reddy Sandy

SHAKEOUTS

Simplicity 6 x 8
Newaygo Reddy Sandy
Allis Chalmers 8 x 10
Simplicity 4 x 6
Simplicity 4 x 8

CORE BLOWERS

Redford No. 1 and No. 2
Champion, CB15, CB18
Demmler No. 55, 1, 2K, 3E
Hansberg Shooter
Demmler 103EO w/feeder skip hoist, semi-auto cycle
Ross Vibra—Draws
Federal San Blo Pulsator, Model L40P1LPP
B&P Flexiblo, Model No. CB-10-DH w/ Universal Blo Plate

CORE OVENS

Tower oven, various sizes
Batch type, core & mold drying, various sizes
Porbeck 16-2B double and single end five drawer
Foundry Equipment, single end, 5 drawer
Porbeck C3C Double End and Single End, Oil Fired

CUPOLAS

Whiting No. 7 with Whiting No. 7 Inclined Skip Dump Charger, Spencer Turbo Centrifugal Blower 75 HP, Foxboro Air Weight Controller, Syntron Alloy Feeder, all new 1957, excellent.

Whiting Nos. 0, 2½, 4, 7, 9, 10
Cupola Blowers, various sizes
Modern swivel charger
Hauck cupola lighter
Series 1000 Bondactor
Cupoliner Model 1500

LADLES AND POURING DEVICES

Modern, Whiting, all sizes plus mixing ladle, electric tilt, cylindrical and tea pot lip pour

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#60 to #250 Crucible & Iron Pot Furnaces, stationary and tilt
Lindberg Fisher Electric Induction
Reda 1000# power tilt type reverberatory
Stroman 1200# Economelt gas fired
Stroman 1600#/hr. reverberatory, 1 station double chamber reverberatory
6000# Fisher Simplex reverberatory complete, gas fired
Lindberg Fisher NMP nose pour, 1000# capacity, gas fired

CLEANING EQUIPMENT

48 x 72 American Wheelabrator with skip and dust collector

42 x 48 American Wheelabrator
36 x 42 American Wheelabrator with skip & dust collector
27 x 36 American Wheelabrator with skip & dust collector
20 x 20 Air Blast Sly Barrel
36 x 72 Sly Tumbling Barrel, gearmotor drive
48 x 48 American Wheelabrator w/skip hoist
American 66" swing table
Pangborn LG 14, 6' table blast

GRINDERS

Marschke 2 x 24
U. S. No. 65, variable speed 24"
Gardner 54" surface grinder
Mummert-Dixon Swing 15 HP 3 x 24"
Gardner 36" opposed wheel surface grinder

AIR COMPRESSORS

100 HP XRB Ingersoll-Rand 2 stage, horizontal
175 HP XRE 2 stage, synchronous motor
30 HP Ingersoll-Rand horizontal
Gardner-Denver 15 HP, water cooled

AIR HOISTS

Ingersoll-Rand 4000#; 10,000#; and a 2000#
Curtis Air Cylinder Hoists

ELECTRIC HOISTS

P & H 500#, 1000#
Comet 500#
Cleveland 1000#
Yale 1000#, 6000#
Budgit 1000#

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Hough Payloaders HA Models
Hyster Forklift 2000#
Towmotor Forklift 7000#
Baker Electric platform 6000#
D. C. Electric Clamshell 1½ Yard
Clamshell Buckets ¾ & 1 Yard
39" Magnet
45" Bolted ECM Magnet
50" Bolted Ohio Magnet
55" Bolted Ohio Magnet
130' of 30" roller conveyor, 3½ rollers, 6" centers, 4" channels
Michigan 12B Front End Loader

2—3 ton Shepard Niles overhead cab operated cranes, 47' span with runway and motor and generator.

TESTING EQUIPMENT

Pittsburgh Brinell Hardness Tester
Sand Testing Equipment
Speedy Moisture Teller
Detroit HB1 Brinell Hardness Tester
One complete Sand Testing Lab set

MACHINE SHOP EQUIPMENT

Cincinnati #118 automatic mill
Betts 52" Vertical Boring Mill, 2 loading arms
Bridgeport vertical milling machine
Niles Radial Drill 13" x 5' arm
American Radial Drill 14" x 7' arm
Peerless Power Hack Saws, all sizes

MISCELLANEOUS

Tabor cutoff saw 7½ HP
Tessmer, Obermayer, Perkins ¾", 1½" blades, sprue cutters
Walker Turner all angle cutoff saw
C & P core knockout
Magnetic Pulleys
Steel Flasks
Slip Flasks, Jackets
500# Print-O-Matic Dial
American Rod Straightener Type F & H

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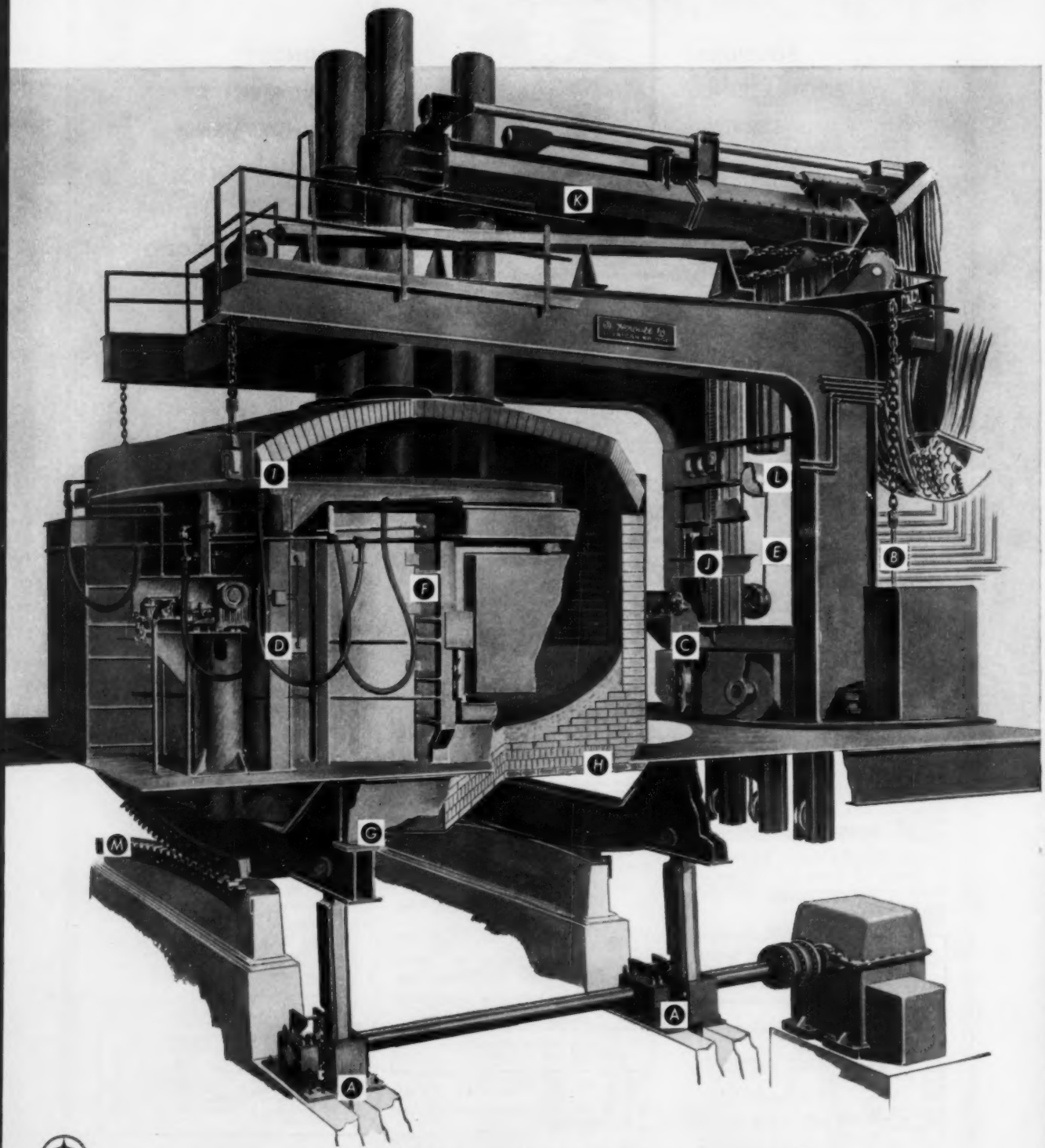
Approximately 50 matchplates and other patterns to produce a line of brass plumbing supplies, all jigs, fixtures, dies and special tooling, approximately $7000 *cost* stock finished parts on hand. National Sales distribution of products produced, list of customers and sales representatives.

WANTED! GOOD SURPLUS EQUIPMENT . . . . .

One piece or a complete foundry—ferrous or non ferrous

Get acquainted with the



This mark tells you a product is made of modern, dependable Steel.

finest Electric Furnace available

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The Heroult is as versatile as it is efficient. With a capacity range of 3 to over 200 tons, the Heroult can handle either ferrous or non-ferrous melting, can be charged through top or door, can accommodate induction-stirring equipment, and can be adapted for duplexing.

If you're looking for performance, efficiency, economy and low-cost maintenance, consider these features:

1. Heroult Furnaces are 100% mechanically operated. Including **(A)** heavy rack-and-pinion-type tilting mechanism, **(B)** motor-driven, rotating, jib-type roof swing, **(D)** winch-operated, water-cooled, jib-type door-lift mechanism, and **(E)** high-speed, electro-mechanical electrode-positioning mechanism.

2. Cage-type shell construction with shell plates loosely attached **(F)** to heavy supporting structure. This construction minimizes shell warping and allows easy replacement of damaged shell plates.

3. Operating mechanism independently supported. The tilting platform on which all operating mechanisms are supported is attached directly to the rockers independent of the shell structure **(G)**. Thus, operating mechanisms are unaffected by shell distortion.

4. Water-cooled, Skew Back Roof ring. This feature **(H)** eliminates the need for special skew-shaped roof refractories.

5. Electrode Mast Safety Device. This spring-loaded, rack-and-pawl-type device **(I)** provides positive protection against damage resulting from electrode winch cable breakage.

6. Square-section, Water-Cooled Electrode Mast Arms. This design **(J)** guarantees a rigid connection between mast and mast arm, thus helping to maintain proper electrode position.

7. Remote-Controlled Electrode Clamps. This device, of the spring-clamp, air-release type, is located inside of the rear section of the water-cooled mast arm where heat cannot affect it.

8. Square-Sectioned Electrode Mast. This design feature **(K)**, developed by American Bridge, assures proper guiding and electrode positioning.

9. Rockers. The heavy fabricated steel curved top and bottom rockers **(L)** minimize forward travel during tilting. These rockers are designed so that the furnace will tend to return to horizontal position from any degree of tilt.

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American Bridge Division of United States Steel

USS

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Combs Gyratory Riddles

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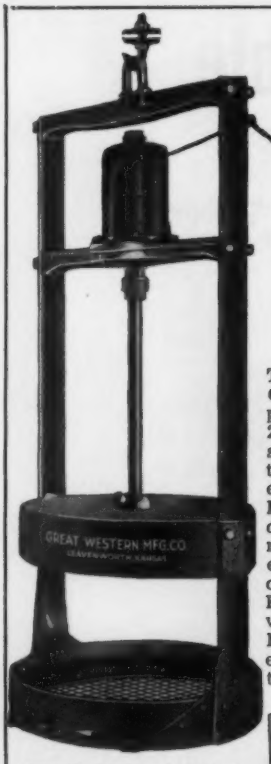
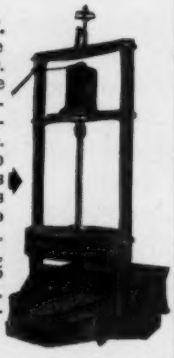


TYPE "CS". Complete price $435.00. 24" square sieve. A continuous operation sieve. Requires no dumping, as refuse is ejected off to one side. Height 4'10", weight 295 lbs, ⅓ H.P. enclosed motor.



TYPE "CR". Complete price $425.00. 24" dia. round sieve. Sifts, fluffs, mixes, aerates sand. Height 4'6", weight 250 lbs., ⅓ H.P. enclosed motor.

TYPE "HL". Price $315.00 complete, less sieves. Laboratory model especially designed for laboratory sand control, fitted with 1/6 H.P. enclosed motor.

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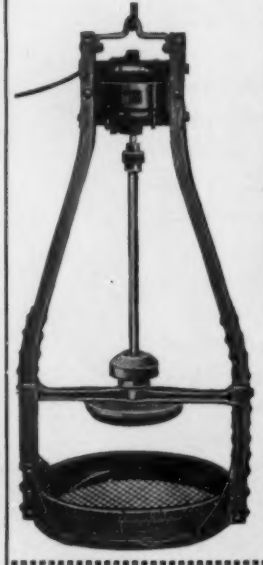

TYPE "V". Price, 20" Sieve, $330.00. Does the work of 10 men. Screens sand, Fine, Medium, and Coarse. 20" dia. sieve with special clamp for 5-second changes. Height 4'6", weight 100 lbs., fully-enclosed 1/6 H.P. motor. Also available in Giant V-5 with 36" sieve for triple capacity . . . Price $600.00

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the controlled silicate CO_2 binder

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MORE LABOR SAVING. Cores are ready for use when they come from core box. You eliminate movement to and from ovens, handling of core driers, cementing of halves.

MORE FLEXIBILITY. Fast curing means faster handling of rush orders. There's no need to stockpile cores for future orders. You have the flexibility to meet customer needs on schedule.

MORE PROFIT. With MOROC you can get this extra capacity and flexibility with a smaller investment in equipment than would be required for additional ovens or shell-molding equipment.

MOROC COMES IN FOUR GRADES

MOROC 1. High-strength binder.

MOROC 2. High strength and good collapsibility.

MOROC 3. High strength and high collapsibility to meet demands of core-blowing equipment.

MOROC 4. Extra-high collapsibility and good flowability.

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Diamond Chemicals

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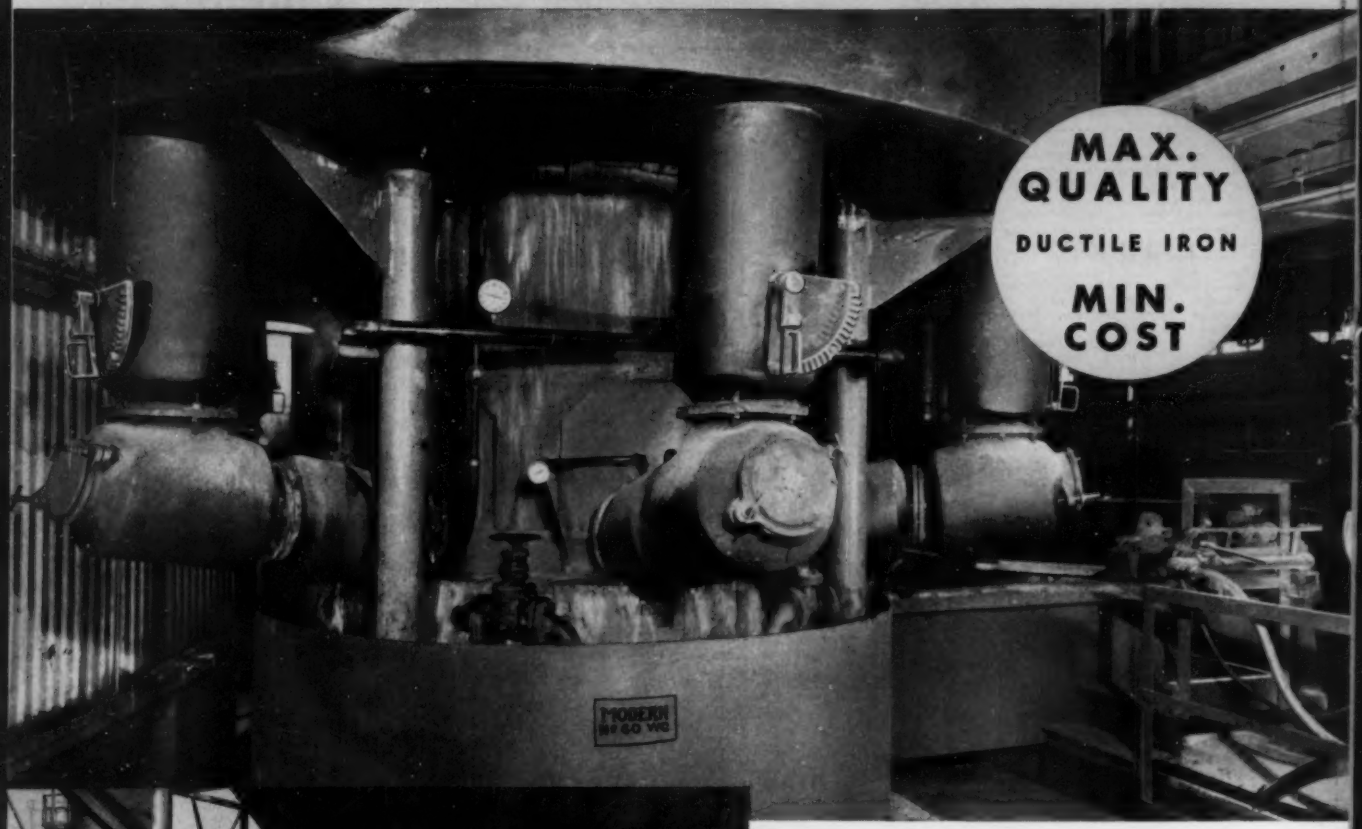

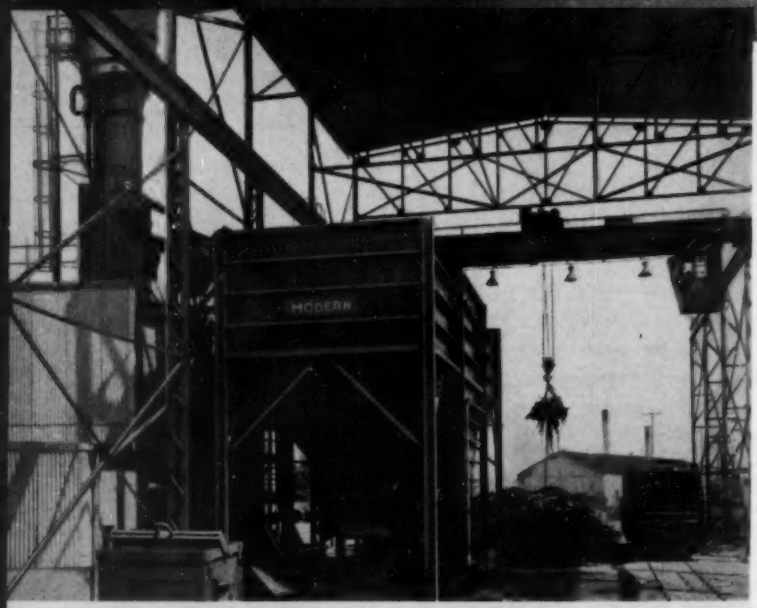

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Overhead traverse is synchronized with conveyor for electrified pouring.

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MODERN

MODERN EQUIPMENT CO., Dept. F-8
Port Washington, Wisconsin

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SUPER-KORFAST CORE PASTE

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NEW ECONOMY – thinly compressed joints use less paste . . . provide more accurate dimensions . . . dries faster, minimizes gas, low water absorption.

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SPEEDS PRODUCTION – dries fast in air or oven. Comes ready to use . . . flows freely and smoothly . . . remains homogeneous in storage.

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WALLINGFORD (CONN.) INDIANAPOLIS SPRINGFIELD (OHIO)

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